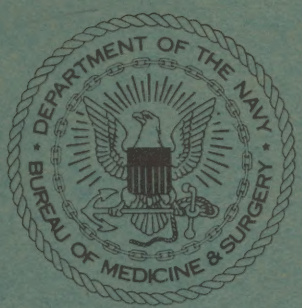
EPIDEMIOLOGY OF THE DISEASES OF NAVAL IMPORTANCE IN MANCHURIA



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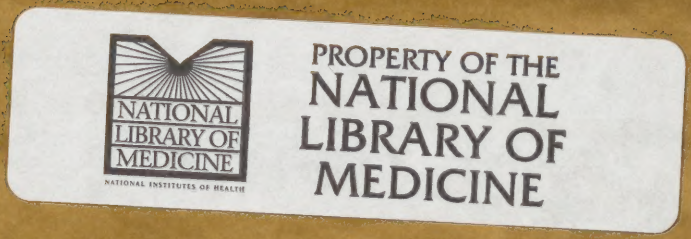

Epidemiology of the Diseases of Naval Importance in Manchuria

Prepared by

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FOREWORD

The purpose of this compilation is to summarize the available medical, parasitological and entomological literature on Manchuria and to present a condensed picture of the prevalence, distribution and transmission of the infectious diseases of military importance, together with information on the distribution, habits and identification of the vectors and reservoir hosts. Emphasis has been placed on the epidemiology of those diseases which present a control problem different from that experienced elsewhere and which can involve large numbers of naval personnel, such as the arthropod-borne diseases and acute infectious diseases.

The area included in this manual is the former "Four Northeastern Provinces" of China, viz. Liaoning, Kirin, Heilungkiang and Jehol and the "Kwantung Leased Territory". The four provinces were administered by the Japanese through a puppet state "Manchoukuo" during the Japanese occupation.

The important sources of information have been the Journal of Oriental Medicine, the Chinese Medical Journal, the Journal of the Chosen Medical Association, Transactiones Societatis Pathologicae Japonicae, Kitasato Archives of Experimental Medicine, Transactions of the Far Eastern Association of Tropical Medicine, Gunidan Zassi (Official Publication of the Imperial Japanese Army Medical Corps), Insecta Matsumurana, Oyo-Dobutsugaku Zassi (Journal of the Japanese Society of Applied Zoology) and the reports of the Institute of Scientific Research. The statistical information has been derived principally from the official reports in the Manchoukuo Year Book, Japan-Manchoukuo Year Book, Manshû Nenkan, the Orient Year Book, Kantocho Tokeisho (Statistical report of the Kwantung Government) and reports of the League of Nations. Classified intelligence reports have also been an important source. The bibliography contains a list of the principal references used in compiling the manual.

The Gazetteer of Chinese Place Names prepared by the Army Map Service, War Department, 1944, is followed to a great extent for the romanization of the names of the places appearing in the manual. However, well established English names, such as Mukden, Harbin, etc., are used in preference to the above.

Acknowledgement is due to Lt. R.J. Dicke, USNR, who has critically examined the entire manual and made numerous valuable suggestions.

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EPIDEMIOLOGY OF THE DISEASES OF NAVAL IMPORTANCE
IN MANCHURIA

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Geography. Manchuria, composed of Liaoning, Kirin, Heilungkiang, and Jehol Provinces, lies between latitude 38° 40' and 53° 50' N. and longitude 115° 20' and 135° 20' E. and embraces an area of approximately 55,000 square miles. It extends from Po-hai Bay in the south to the Amur River bordering Soviet Siberia in the north. The Ussuri River forms a natural boundary with the Maritime Province of the U.S.S.R. to the east and the rivers T'umen and Yalu are recognized as the boundary with Korea to the southeast. The internal boundary with Mongolia in the west is more indefinite and runs in a general course along the Great Hsingan Mountain range (Ta-hsing-an-ling). Between this mountain range and the Ch'ang-pai-shan range along the eastern border of the country are extensive plains crossed by a number of navigable rivers.

The coastline of Manchuria is extremely short, consisting of about 690 miles or about one-eighth of the total boundary of the country. It extends from the mouth of the Yalu River to Shanhaikuan where the Great Wall joins the sea. The most important of the harbors is Ta-lien (Dairen) which is located on the east side of the Liaotung Peninsula. The harbor is protected on three sides by land, opening to the east. It is 36 feet deep at the entrance, with a minimum of 23 feet at low tide at the wharves. Lü-shun (Port Arthur) is a land locked harbor situated at the southern extremity of the Liaotung peninsula, about 20 miles southwest of Ta-lien. This is the only port in Manchuria which is ice-free throughout the year. An-tung, at the mouth of the Yalu River on the Korean border, is an important shipping port for timber. The river around the port is 3,300 to 5,000 feet wide and twelve feet deep at low tide. It is closed to traffic by ice during the winter months. Ying-kou is situated at the mouth of the Liao River on the western side of the peninsula. The average depth within the harbor is from 20 to 33 feet at low tide, with its deepest portion as much as 50 to 70 feet. The harbor is practically closed by ice from the middle of December to the latter part of March. A section of land, known as Hu-lu-tao, projects into the sea of Lien-shan Bay around which the water is deep and free from ice in winter. It is connected by railway with the mainland.

The southern part of the Liaotung Peninsula with an area of 1,336 square miles and including 40 adjoining islands is known as Kwantung Leased Territory. This territory together with a zone along the South Manchuria Railway were leased to Japan after the Russo-Japanese War. In 1931 Japan occupied the whole of Manchuria. A puppet government was established in the following year which proclaimed the independence of the four provinces from the Republic of China. In 1934, Manchuria was divided into 14 provinces or administrative units, with subsequent changes to 16 provinces in 1937, to 18 in 1939, and to 19 in 1941. Further change of the administrative units was made in 1943.

Climatology. Manchuria has a continental climate marked by extremes of heat and cold. Intensely cold winters alternate with intensely hot summers. In many places the temperature ranges from 40° C. to as many degrees below zero. The hottest month of the year is July and the coldest, January. The highest temperature on record was 42° C. recorded at Chalantum on July 23, 1919, while the lowest was 50.1° C. below zero at Mientuho on January 16, 1922. The mean temperature falls as one moves further inland in a north and north-westerly direction from Ta-lien to Man-chou-li. In Ta-lien the mean temperature of the year is 11.0° C. It is 8.3° in Mukden, 4.7° in Ch'ang-ch'un, 3.1° in Harbin, and 1.8° in Man-chou-li.

Rain and snow are generally not abundant and excessive drought occurs in many parts of the country. The average annual rainfall is from 500 to 700 mm. The rainy season begins in June and ends in September. In Ch'ang-ch'un the rain during these four months makes up 77 per cent of the total annual precipitation while the precipitation in July and August makes up 55 per cent of the annual total. The rainfall is more abundant in the southern part of Manchuria, becoming less as one proceeds northward. The annual rainfall is 678.4 mm. at Mukden, 660.9 mm. at Ch'ang-ch'un, 577.3 mm. at Harbin, 464.0 mm. at Tsitsihar and 272.2 mm. at Man-chou-li. The area east of the South Manchuria Railway Line has an annual rainfall ranging from 600 mm. to 1,000 mm., with less precipitation west of the line. The heaviest rainfall recorded in 24 hours occurred at Yingkou on August 13, 1811, with 209.2 mm. On the same day Mukden had a rainfall of 148.7 mm. The earliest date of frost was September 3rd at Mientuho in northern Manchuria and the latest was November 13th at Port Arthur in southern Manchuria. The frost ends in the northern region between April and May and in the southern region during the latter part of April. Snow is first encountered about the end of September in the north, and one month later in the south. The average humidity in Manchuria ranges from 60 to 68 per cent. The driest months are April and November, when the humidity often drops to 10 per cent.

Population. Manchuria is not heavily populated except in a few cities in the southern part. However, the population of the country has been notably increased in the last 50 years. In 1907 the population was estimated at 16,780,000 for the three Eastern Provinces, and at the end of 1939 it was officially reported as 40,679,570, including 1,225,570 in the Kwantung Leased Territory. The Chinese are the predominant race, accounting for 94.94 per cent of the total population in 1939. The Koreans followed with 2.87 per cent and the Japanese with 2.05 per cent. Since the Japanese occupation in 1931, the Japanese Government adopted a program of colonization in Manchuria. Japanese immigration into Manchuria was encouraged and subsidized by the Department of Overseas Affairs and private companies, and at the same time the immigration of Chinese from other parts of China was restricted. During the year 1938, the Japanese population in Manchuria increased at a ratio of 248 per 1,000, while it was 133 for the Koreans, 40 for the Chinese and -9 for other nationalities. In 1939 the average population density in Manchuria was approximately 30 persons per square mile. By far a greater density is found in southern Manchuria especially along the South Manchuria Railway. The population density decreases toward the interior of northern Manchuria. In the southern part of Liaoning Province there are from 60 to 129 persons per square mile while in the northern part of Heilungkiang Province there are only 4.2 to 5.1 persons per square mile.

Public Health Administration. The Public Health Administration in Manchuria has gone through several changes since the establishment of a puppet government.

The latest available information shows that the central organization of public health is the Bureau of Public Health, which is a part of the Department of People's Welfare. The Bureau consists of four sections: the Medical Affairs Section, the Preventive Medicine Section, the Plague Prevention Section and the Medical Supply Section (Manshû Nenkan 1943). In the provinces there are health divisions which are directly under the provincial Department of People's Welfare. In the hsien and cities the public health affairs are taken care of by the respective police stations. A public physician system (Kung-yi-chih) was established in 1933 to promote education in sanitation among the people, and to improve their general health. One public physician was to be appointed to each district (hsien) or banner (ch'i). Besides carrying on his regular practice, the public physician was to take charge of matters relative to public health, sanitary investigation and medical affairs of the police. Coupons for free medical treatment were issued to the poor people. At the end of 1939, 157 such public physicians were scattered throughout the country. Public physicians were also provided for Japanese colonization.

The Sanitation Section of the Police Department, Kwantung Government was in charge of the public health administration in the Kwantung Leased Territory and the Railway Zone. The Local Affairs Department of the South Manchuria Railway Company had participated to a great extent in the public health affairs in the railway zone. Quarantine and other hygienic matters in the harbors of Ta-lien and Lü-shun were under the supervision of the Marine Bureau of the Kwantung Government.

Medical Facilities. The number of medical schools in Manchuria is uncertain due to the frequent renaming of old schools following the change of names of the localities where they are situated, and the incomplete or even contradictory reports concerning those newly established. There are probably 14 medical schools, including two dental schools. Mukden is one of the most important medical centers in the country. There are at least three medical schools in this city, the Manchuria Medical University, the Mukden Medical College, and the Fengtien Medical College The Manchuria Medical University, which is probably the most important medical institution in Manchuria, was founded in 1911 under the management of the South Manchuria Railway Company. It offers a preparatory course of three years and a university course of four years. It had a total enrollment of 935 in April 1939 and had a total of 941 graduates up to 1935. The Mukden Medical College was established in 1910 under the management of an English Mission. The Fengtien Medical College was established in 1933 and had an enrollment of 125 and a staff of 41 in 1939. There appears in some publications a fourth name, the Mukden-Tungshan Medical School, the status of which is not clear. Harbin is another medical center in Manchuria. The Harbin Medical College had an enrollment of 323 and a staff of 37 in 1939. The total number of graduates from this college was 164 up to 1935. There is also a Military Surgeon School with about 30 graduates up to 1935. One of the three Colonization Medical Academies which gave a two-year course is located in Harbin. The other two are one each in Lung-ching and Tsitsihar. There are also two Russian dental colleges in Harbin and a dental institute incorporated in the Harbin Medical College. The Hsinking Medical College was established by the puppet federal government at Ch'ang-ch'un and had an enrollment of 270 students and a staff of 28 in 1939. The Chia-mu-ssu Medical College was established in 1940 for the welfare of the Japanese immigrants. The Hsingan Medical College, situated at Wang-yeh-miao, near the northern border of Liaoning province is for the Mongolians.

Bacteriological laboratories have been established by the South Manchuria Railway Company at Mukden, Ying-kou, An-tung, Ch'ang-ch'un, and Fu-shun. Medical experts are attached to each laboratory to enforce preventive measures. Several bacteriological examination stations are also maintained in certain towns. The Hygienic Institute in Mukden has been founded by the South Manchuria Railway Company for studies on the local health problems and the manufacture of sera and vaccines for the prevention of diseases peculiar to Manchuria.

There has been an increase in the number of hospitals in Manchuria in recent years. By the end of 1940 there were four federal hospitals located in Yung-chi (Kirin), Cheng-te, Yen-chi and Lung-ching, eight provincial hospitals, 174 municipal, district, or banner hospitals and 120 fumin (people's welfare) clinics. In addition, 45 hospitals and clinics were operated by the Manchuria Railway Company and eleven by the Manchuria Red Cross Society. The number of beds in these hospitals is not known. However, a total of 6,196 beds were reported in 111 government and public hospitals in 1939. As the number of hospitals increased in 1940, the total number of beds probably increased accordingly. There was also a federal leprosy clinic located in Tieh-ling, and a hospital for the insane at Harbin. The number of public physicians in charge of the medical affairs for the people in remote regions where no other medical facilities are available has increased from 148 in 1937 to 157 in 1939. Hospitals operated by foreigners are located in various regions in Manchuria and have rendered valuable service not only to foreigners but also to the native population. There were 16 such hospitals in 1940, twelve operated by the British, two by the Danish, and one each by the Canadians and the French. In the Kwantung Leased Territory the Kwantung Government maintains five hospitals, two in Ta-lien and three in Port Arthur, with a total of more than 20 physicians. The Dairen (Talien) Hospital which is one of the hospitals established by the South Manchuria Railway Company is one of the best equipped hospitals in the country. In addition, there are about eight other private hospitals in the leased territory.

Physicians in Manchuria are classified into two groups, those of the native school and those of the Western school. In March 1939 there were in all 23, 367 physicians, of whom only 4,519 were trained in modern methods. This total figure represents a ratio of 6.2 doctors per 10,000 population. However, for the qualified physicians the ratio was only 1.2 per 10,000 population. In the same month 653 dentists and 800 pharmacists were reported in the country of which probably no more than one third to two thirds were fully qualified. The total number of nurses was reported to be 2,100 at the end of 1938.

CHAPTER I

DYSENTERY

Due to insanitary conditions and the lack of a satisfactory water supply, dysentery is one of the most prevalent infectious diseases in Manchuria and an important cause of morbidity and mortality among children as well as adults. According to the statistics of the Kwantung Government (Tsubozaki, 1939) there was an average of 76.3 dysentery cases with 6.7 deaths for every 10,000 persons in the Kwantung Leased Territory. In the Manchuria Medical College Hospital the number of dysentery cases represented 16.9 per cent of the total admissions and 47.2 per cent of the total cases of communicable diseases during the years 1933 to 1935 (Itonoke, 1938). The Manchurian Government reported 38,192 cases of acute infectious diseases in Manchuria during the three-year period 1934 to 1936. Of these, 12,196 were dysentery cases, representing nearly one-third of the total number of cases (Tsubozaki, 1939). Kawahito (1936) reported that the average mortality rate for dysentery among the Japanese in Manchuria was 9.8 per 10,000 during the years 1925-1930.

Both the bacillary and the amebic types of dysentery are widespread. Although most of the early reports do not differentiate the types of the disease, it is assumed that nearly half of the cases are of the amebic type. The so-called Manchurian dysentery which is widespread among the inhabitants seems to be amebic dysentery (Hiyeda, 1934). A high percentage of the people were reported to be carriers of dysentery bacillus and Endameba histolytica. About 1.2 per cent of the school children and 3.86 per cent of the workers in the public places were found to be carriers of dysentery bacillus, and a large proportion of these (44.6 per cent to 77.8 per cent) were of the Shiga type (Tsubozaki, 1937). According to Hiyeda (1934), an average of 21 per cent of the Manchurian population, and in the heavily infested areas as many as 38 per cent, were cyst-carriers of E. histolytica. The disease occurs throughout the year but is most prevalent during the summer months from June to September.

Notes on the Distribution and Incidence of Dysentery. In Ta-lien, Hoshizaki (1928) of the Dairen (Ta-lien) Isolation Hospital studied 1,220 cases of dysentery treated in the hospital during a period of ten years, and reported that the ratio of bacillary to the amebic type was 34 to 1. The case fatality was 54.9 per cent for bacillary dysentery and 17.2 per cent for amebic dysentery. The highest case incidence occurred in the age group of one to five years, dropping sharply at the ages of 11 to 15, and then gradually increasing until the incidence reached another peak at the age group of 26 to 30 years. The seasonal incidence suddenly increased in June, reaching its peak during the months of July to September, and then rapidly decreasing by October. One hundred ninety six (196) cases were treated in the hospital in 1927. Of these 167 cases were bacillary, 26 ekiri and only three were amebic. Yokoyama (1937) made an epidemiological survey of the Japanese dysentery cases in the city of Ta-lien from 1930 to 1934. There were 1,892 cases reported during this period representing about one third of the communicable disease and a morbidity rate of 33.5 per 10,000 population. The average mortality of this series was 13.8 per cent. Dysentery cases occurred throughout the year. The period of highest incidence was observed during July to October, accounting for 80 per cent of the total cases. The seasonal distribution of the 1,889 dysentery cases reported, and the number of deaths recorded during the period 1931 to 1935 is shown in Table 1.

TABLE 1

SEASONAL DISTRIBUTION OF DYSENTERY IN TA-LIEN IN 1931-1935

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Cases	33	45	51	39	30	80	283	590	408	217	65	48	1,889
Deaths	6	12	8	4	4	10	29	57	74	31	11	7	257

Of 421 cases of the bacillus type studied, 247 or 58.7 per cent occurred during the ages one to ten years, and 73 or 17.3 per cent during the ages 21 and 30 years. Ekiri, a foudroyant form of dysentery in children, accounted for 29 per cent of the pediatric dysentery cases in Ta-lien (Hatai, 1924). The mortality of this form of the disease was about 43 per cent. In Lü-shun (Port Arthur), 118 dysentery cases were treated in the Lü-shun Hospital from 1928 to 1932, and 318 cases including three cases of amebic dysentery were treated in the Lü-shun Clinic according to the report of the Kwantung Government (Hiyeda, 1933).

Our knowledge of the disease in Mukden is derived mainly from reports of workers in the Manchuria Medical College. Kato and Hisamochi (1933) reported 813 cases of dysentery received by the Manchuria Medical College during a period of six years from 1927 to 1932, representing about 52.3 per cent of the total cases of infectious diseases admitted in the same period. Of these cases, 231 (28.4 per cent) were bacillary dysentery, 31 (3.8 per cent) amebic, and 556 cases (68.3 per cent) undertermined. Cases occurred throughout the year, but the highest incidence (35.8 per cent) was in July, followed by June and August, with 17.4 per cent each. In 1933, 307 dysentery patients were treated in the College Hospital of which 105 were bacillary, 75 amebic, 21 mixed cases, and 106 undertermined (Hiyeda 1935). Taylor (1935) reported 313 cases of bacillary dysentery against 130 cases of amebic dysentery treated in Mukden Medical College during 1929-1933, representing a ratio of 24 to 10 for the two types of the disease. Itonoke (1938) studied 438 cases of dysentery admitted to the Department of Internal

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Medicine, Manchuria Medical College, from 1933 to 1935. This number represents 16.9 per cent of the total admissions and 47.2 per cent of the total cases of reportable diseases. The incidence of males was much higher than that of females, being 74.4 against 25.6 per cent. Sixty per cent of the patients were of the age group 20 to 30 years. The seasonal distribution of this series showed that the disease occurred throughout the year, the incidence increasing in June, reaching its peak in July and beginning to decrease in August. The case fatality rate was about four per cent. In 1940, Kikuta reported the result of mercury treatment among 31 amebic dysentery patients in the Mukden Army Hospital. Altogether 183 cases of dysentery were admitted to the hospital from July 1937 to June 1938. All of the patients were soldiers transferred from north China. The amebic cases represent 16.9 per cent of the total. The disease is more prevalent with higher mortality among children than among adults. Over a period of five months from May to October, 1931, 98 cases were treated in the Pediatric Department, Manchuria Medical College, 39 or 39.9 per cent of them being positive for dysentery bacillus. Tsuji et al (1938) over a period of three years studied 1,230 cases of the disease treated in the Manchuria Medical College, 813 cases in the Takamori Laboratory of Internal Medicine and 417 cases (including 43 cases of ekiri) in the Pediatric Department. The case fatality was 2.2 per cent among the adult patients and 15.5 per cent among children. Dysentery bacilli were found in 63.7 per cent of the cases and only 25 cases were amebic dysentery. Forty-three cases among the children were ekiri representing 10.3 per cent of the total pediatric cases. The case fatality rate of ekiri was 69.7 per cent, being higher than that reported for the city of Ta-lien. Dysentery was epidemic in Mukden in 1939 when 1,263 cases were admitted to the Mukden Municipal Isolation Hospital (Aoki and Suo, 1940). The incidence greatly increased in May, reached its peak in June and practically ceased after September. The case fatality rate was 15.9 per cent among children and 3.8 per cent among adults. The highest mortality occurred in September as the disease became more malignant at the end of the epidemic.

Hiyeda et al (1935) reported that about 20 per cent of the apparently healthy workers along the South Manchuria Railway were infected with amebic dysentery. In Ch'ang-ch'un (Hsinking) of Kirin Province, 311 cases of dysentery (including ekiri) were reported in 1934, 366 in 1935, 302 in 1936, and 240 in 1937 (Abe and Kaneko, 1938). The disease is most prevalent from May to September with a peak in July. The case fatality of the disease was from 1.99 per cent in 1936 to 7.38 per cent in 1935, with an average of 5.09 per cent for the four years. The morbidity of the disease was highest (11.7 per 1,000) during the ages under five years, followed by 6.6 per 1,000 during the ages from five to nine years and from 20 to 29 years. The lowest incidence occurred between the ages of 10 to 14 (1.1 per 1,000). The average morbidity of the disease was 4.9 per 1,000 for the four years studied. Only 0.82 per cent of the cases in 1935 and 3.31 per cent of the cases in 1936 were definitely amebic.

Although it is believed that dysentery is widespread all over Manchuria, data regarding its incidence in other localities than those discussed are extremely rare. An outbreak of the disease occurred in Fu-shun in 1928 with 121 cases reported in the city during the first three months of the year (Health Dept., S.M.R. Co., 1929). According to the report of the South Manchuria Railway Company, there were 1,141 cases of dysentery treated in 14 of their hospitals of which 90 cases were proven to be amebic dysentery. The distribution of these cases is shown in Table 2 (Hiyeda, 1932 and 1933).

TABLE 2

DYSENTERY CASES REPORTED BY THE SOUTH MANCHURIA RAILWAY CO. IN 1930

	Dysentery Cases	Proven Amebic Dysentery Cases
Mukden	205	6
Fu-shun	256	0
Ch'ang-ch'un	156	0
An-tung	107	0
Liao-yang	76	2
An-shan	66	19
Pen-chi-hu	43	23
Szu-ping-chieh	42	2
K'ai-yuan	41	38
Tieh-ling	38	0
Wa-wu-tien	33	0
Ta-shih-chiao	32	0
Ying-kou	29	0
Kung-chu-ling	17	0
Total	1141	90

Among 611 residents in Chang-chia-tien, Kirin, 73 suffered from dysentery with four deaths in 1938 (Ozaki, 1938). According to the reports of the League of Nations, the following cases of dysentery were reported along the Chinese Eastern Railway Zone among a population of about 44,000: 567 in 1928, 292 in 1929, 193 in 1930, 131 in 1931, 123 in 1932, 109 in 1933 and 75 in 1934. There were altogether 31 deaths in seven years representing a case fatality rate of 2.08 per cent. Lin and Wu (1927) reported 104 cases in Pin-chiang (Harbin) over a period of four months from January to June, 1926, representing 20 per cent of the total number of cases of infectious diseases. In the Liao-si region, Takematsu (1933) reported 25 cases of the disease occurring in the Japanese Army from July to September.

Types of dysentery bacilli in Manchuria. Hoshi (1929) studied 241 strains of dysentery bacilli isolated from 241 dysentery patients in South Manchuria with the following results:

By agglutination:

Shiga Type I	12.0 per cent
Shiga Type II & III	48.6
Shiga Type IV & V	39.4

By carbohydrate fermentation:

Original Shiga type	12.2 per cent
Quasi original type	2.4
Y-type	46.3
Flexner type	23.8
Strong type	4.3
Hiss IV type	5.5
Masugi C type	3.1
Masugi D type	1.2
Ohara & Minota type	1.2

Tsubozaki (1939) made a bacteriological study of dysentery and dysentery-like diseases in Manchuria. Three hundred thirteen (313) strains of dysentery bacilli were collected from all over Manchuria during the epidemic of 1936 and classified according to various methods. The results may be summarized in Table 3.

TABLE 3

TYPES OF DYSENTERY BACILLI ISOLATED IN MANCHURIA IN 1936

Method of Classification	Type	No.	Percentage
Shiga	Typical	38	12.14
	Atypical I	159	50.8
	Atypical II	4	1.28
	Atypical III	2	0.64
	Others	110	35.14
Lentz & Prigge	Shiga-Kruse	38	12.14
	Schmitz	2	0.64
	Flexner	95	30.35
	Y	159	50.8
	Strong	4	1.28
	Kruse-Sonne	11	3.51
	Others	4	1.28
Futaki	Shiga	38	12.14
	Komagome A	44	14.06
	Komagome B	156	49.84
	Kawase	4	1.28
	Nakamura	24	7.67
	Ohara	11	3.51
	Others	36	11.50
Tsubozaki	Shiga-Kruse	38	12.14
	Paradysentery A	255	81.15
	Paradysentery B	4	1.28
	Schmitz	2	0.64
	Ohara (Kruse-Sonne)	11	3.51
	Others	3	0.96

The geographical distribution of the different types in this series is as follows (Table 4):

TABLE 4

GEOGRAPHICAL DISTRIBUTION OF BACILLUS TYPES IN 1936

	Types	Ta-lien	Port Arthur	An-shan	Mukden	Ch'ang-ch'un	Har-bin	Tsi-tsihar	Cheng-te	Hala	Total
Lentz & Prigge Classification	Shiga-Kruse		3	5	18	12					38
	Schmitz				2						2
	Flexner	22	6	9	30	25	3				95
	Y	9	1	12	43	83	2	1	4	4	159
	Strong				2	2					4
	Kruse-Sonne		5		2	4					11
	Others	2				2					4
Tsubozaki Classification	Shiga		3	5	18	12					38
	Paradysentery A	30	7	20	74	110	5	1	4	4	255
	Paradysentery B	2				2					4
	Schmitz				2						2
	Ohara		5		2	4					11
	Others	1		1	1						3
	Total	33	15	26	97	128	5	1	4	4	313

Tsuchiya and Nagata (1928) stated that in South Manchuria Shiga dysentery bacillus were almost always isolated from a great many dysentery cases among children, and that its toxicity was more virulent than the Japanese type. In Ta-lien, Hoshizaki (1928) isolated a number of strains of dysentery bacilli from the stools of 95 patients during the epidemic of 1927 and classified them as follows:

1. By carbohydrate fermentation and indol reaction:

Original type of Shiga	39.3 per cent
Y-type (Hiss-Russel)	46.1
Flexner-type	5.6
Strong-type	5.6
Mannit non-fermenter	3.5

2. By agglutination reaction:

Original type of Shiga	39.3 per cent
Y-type	53.9
Flexner-type	6.8

Matai (1924) isolated 28 strains from 123 ekiri cases in Ta-lien and classified them as variant type I (60 per cent), variant type II (15 per cent) and variant type III (25 per cent). Yokoyama (1936) classified the strains of bacilli isolated from 163 dysentery cases in Ta-lien according to the classification of Shiga and Hiss and reported that five per cent belonged to the typical type (type I); 57 per cent to type II, 27 per cent to type III and eleven per cent to type IV. The most common types in Ta-lien were type II and type III. The former was only prevalent in summer, while the latter occurred during other seasons as well. In Mukden, Nakamura (1930) examined stools of 60 cases during the dysentery epidemic in the summer of 1929. Dysentery bacillus was found in 44 cases with litmus-agar medium, representing 73 per cent. Of the 44 strains, 29 (or 65.9 per cent) belonged to the Flexner type, twelve (or 27.2 per cent) belonged to the Y-type and three to the Shiga type. Tsubozaki (1939) studied 51 strains of dysentery bacilli collected at Mukden and 49 strains collected at Ch'ang-ch'un in 1938. Table 5 shows the classification of bacillus types in these two series.

TABLE 5

TYPES OF DYSENTERY BACILLI IN MUKDEN AND CH'ANG-CH'UN IN 1938

Classification	Type	Mukden	Ch'ang-ch'un	Total
Lentz & Prigge	Shiga-Kruse	18	16	34
	Schmitz	3	0	3
	Flexner	13	10	23
	Y	16	22	38
	Strong	0	0	0
	Kruse-Sonne	1	0	1
	Others	0	1	1
Tsubozaki	Shiga	18	16	34
	Paradysentery A	29	31	60
	Paradysentery B	0	1	1
	Schmitz	3	0	3
	Ohara	1	0	1
	Others	0	1	1
	Total	51	49	100

Koike (1938) reported that 195 strains of dysentery bacilli were collected from Mukden, Ch'ang-ch'un, Fu-shun, An-shan, and Ying-kou during the months of July and August 1936, and were classified as follows:

34 belonging to the typical type, four to Ohara type and 157 to atypical type. Of the bacillary dysentery in Ch'ang-ch'un (Hsinking) studied by Abe and Kaneko (1938), the following types of bacilli were reported:

	Per Cent				
	Shiga	Para	Ohara	Undetermined	Positive
1934		2.69		3.37	6.06
1935	4.86	14.94	0.82	0	21.44
1936	5.96	53.64	1.32	0	64.23
1937	12.18	46.55	1.68	0	60.41
1938	14.29	64.29	7.14	0	91.72

Of 23 cases of bacillary dysentery among the Japanese troops stationed at Liao-si region, eight were infected with bacillus of the Shiga type, six of the Y-type, one of the F-type and ten were unclassified.

A high percentage of the people in Manchuria are found to be dysentery bacillus carriers, especially of the Shiga type. Tsubozaki (1937) made a survey on the bacillus carriers among the workers in public places in Mukden and reported that of 1,430 persons examined in April 1937, 56 (or 3.86 per cent) were found to be carriers of dysentery bacilli and that 25 (44.6 per cent) of the positives carried Shiga bacillus. Tsubozaki et al (1937) examined 758 Chinese school children and 844 Japanese school children in Mukden for dysentery bacilli. The carrier rate was found to be 1.17 per cent for the former group and 0.12 per cent for the latter group. Of these, 77.7 per cent of the carriers were infected with Shiga bacillus. Watanabe and Ikeda (1938) examined 1,300 Japanese soldiers in the same city and found that 2.5 per cent of them were carriers of dysentery.

Amebic Dysentery. The actual incidence of amebic dysentery in Manchuria is not clear because most of the reports do not contain the specific figuration of the types of the disease. Although it is estimated that nearly half of the dysentery cases in Manchuria are of amebic type (Hiyeda, 1933), the information derived from literature shows a much lower percentage, due probably to the lack of technique in examinations. Hoshizaki (1928) reported only 35 cases of amebic dysentery out of 1,220 dysentery cases treated in the Dairen Isolation Hospital over a period of ten years from 1917 to 1927. Yokoyama (1937) reported 45 cases of amebic dysentery with four deaths as against 163 cases of bacillary dysentery with four deaths among the Japanese in Ta-lien from 1931 to 1935. According to the Kwantung Government there were 122 cases of amebic dysentery treated in various hospitals in Ta-lien and Lü-shun from 1927 to 1932 against 2,217 bacillary cases during the same period (Hiyeda, 1933). In 14 hospitals along the South Manchuria Railway there were treated 1,141 dysentery cases in 1930 of which only 90 were demonstrated to be amebic. The geographical distribution of these cases is by no means uniform. Of 256 dysentery patients in Fu-shun in 1931 not a single amebic case was verified, while of 41 dysentery cases in K'ai-yüan 38 were amebic dysentery (Hiyeda, 1932, 1933).

In the Manchuria Medical College Hospital 40 per cent of the dysentery cases in 1932 were bacteriologically proved to be bacillary cases, most of the bacteria negatives being amebic cases. In 1933, 307 dysentery cases were treated in the college hospital. Of these, 105 were bacillary, 75 amebic, 106 unidentified and 21 mixed infections (Hiyeda, 1933, 1934). Of the 438 cases of dysentery treated at the Takamori Laboratory of Internal Medicine, Manchuria Medical College from 1933 to 1935, 9.8 per cent were proved to be bacillary, 15.7 per cent amebic and 3.4 per cent mixed (Itonoke, 1938). Tsuji and Sasaki (1938) however worked at the same hospital and reported that dysentery bacilli were found in 63.7 per cent of 1,187 cases of dysentery and amebic dysentery was demonstrated in only 25 cases. In Ch'ang-ch'un only 0.82 per cent of the dysentery cases in 1935 and 3.31 per cent of those in 1936 were proved to be amebic dysentery.

Endameba histolytica was observed to be a common intestinal parasite in Manchuria. Of 350 Japanese farmers examined in Ying-kou, 65 (18.5 per cent) were found to be ameba carriers (Kitabatake, 1935). Hiyeda (1933, 1935) reported that about an average of 21 per cent of the apparently healthy Chinese laborers in various localities along the South Manchuria Railway are cyst-carriers of E. histolytica and in some places the infection was as high as 38 per cent. Hiyeda et al (1935) reported that about 18 per cent of the farm workers in Ying-kou were infected with the parasite. Kondo (1939) examined feces of 162 adult Japanese in Peng-chih-hu and found only nine (five per cent) of them to harbor cysts of E. histolytica.

Diarrhea and Enteritis. Due to food contamination, water pollution and other insanitary conditions, diarrhea and enteritis are common in Manchuria. Kawahito (1936) showed that the death rate due to these diseases among the Japanese in Manchuria was from 7.1 to 14.2 per 10,000 in 1925-1930. These diseases seem to be more prevalent in Ta-lien, Ying-kou, An-tung and Liao-yang than in other cities. Cases occur throughout the year, but the incidence is highest from June to October.

CHAPTER II

CHOLERA

Cholera has been known in China since ancient times. Numerous epidemics have been recorded which often swept from south China to Manchuria. Modern records of the disease in Manchuria go back as far as 1862 when the epidemic spread from the south. Such epidemics recurred in 1877, 1883, 1884 and 1902. In 1907 the disease occurred in Ta-lien, Lü-shun, Liao-yang, and An-tung, and many cases were reported. In 1909 a number of cases were again reported from Ta-lien, Ying-kou, Ta-shi-chiao, and Liao-yang. In 1911 cholera epidemics occurred in the Kwantung Leased Territory with 143 cases. Several cases were discovered on board ship in Ta-lien in 1913 and 1916. In 1919 an epidemic started from Swatow, invaded Shanghai in July and then attacked Ying-kou and spread all over Manchuria, involving more than 300,000 cases. In Manchuria, 13,000 cases with 6,300 deaths occurred. The epidemic ended in October and only a few cases were reported in the following year. In 1922, 18 cases were reported in Ying-kou of which one was discovered on a boat, and six cases from Ta-lien of which five were on a boat. In 1926 six cases were reported from Harbin in August and the disease reached An-tung, Mukden, Lü-shun, Ta-lien and Pi-tzu-wo with a total of 61 cases. In 1927, 29 cases were reported from Ying-kou, two cases and two vibrio-carriers in Ta-lien (on a boat), and 130 cases from Harbin and its vicinity. In 1929 three cases occurred in Ying-kou.

In June, 1932, an epidemic with unprecedented violence started from Ta-lien and Ying-kou and spread to northern Manchuria by August. The epidemic ended in the middle of September with about 6,500 cases and 3,000 deaths. Table 6 lists the number of cases and deaths in different localities (Manako, 1933).

TABLE 6

CASES OF CHOLERA IN MANCHURIA, 1932

Locality	No. Cases	No. Deaths	Started	Ended
Lü-shun	21	11	July 24	Sept 7
Ta-lien	163	107	June 30	Sept 17
Pi-tzu-wo	75	15	Sept 3	Sept 22
Chin-chou	9	7	July 12	Sept 16
P'u-lan-tien	19	16	July 18	Sept 19
Wan-chia-ling	5	-	July 24	July 30
Kai-p'ing	8	7	July 17	Aug 11
Ying-kou	65	30	June 28	Sept 22
Liao-yang	26	16	July 28	Sept 17
Mukden	108	57	July 18	Sept 17
Tieh-ling	22	14	Aug 10	Sept 17
Kai-yuan	9	5	Sept 19	Oct 15
Kung-chu-ling	1	-	Sept 27	Sept 27
Ch'ang-ch'un	92	67	July 11	Aug 19
An-tung	54	37	Aug 1	Sept 21
Fu-shun	15	14	Aug 3	Sept 11
Chin-hsien	21	9	July 15	Sept 29
Liao-yuan	141	67	July 16	Sept 20
Kou-pang-tzu	2	2	Aug 8	Aug 8
Tsitsihar	332	120	July 22	Aug 22
Tung-liao	3,000	1,414	July 10	Sept 8
Harbin	608	365	Aug 3	Sept 15
Yung-chi (Kirin)	70	28	Aug 1	Sept 19
Hsin-min-tun	730	325	July 23	Aug 31
Chien-chia-tien	30		July 20	Aug 8
Ta-lin	30		July 20	Aug 8
Yao-nan	391	173	July 20	Aug 8
Pei-chen	330	155	Aug 3	Sept 6
Chia-lun	30		July 16	Aug 31
San-hsing (I-lan)	32	24	July 25	Aug 8
Pa-mien-cheng	2		Aug 7	Aug 11
Kai-tung	11	7	Aug 10	Aug 10
Wen-ho	5		Aug 3	Aug 21
Hsia-chang-tang (?)	14		Aug 5	Aug 11
Tai-p'ing-chuan	2	2	Aug 10	Aug 18
Chien-wei	6		Aug 15	Aug 30
Total	7,479	3,094	Aug 25	Sept 2

It is noted that the epidemics of cholera in Manchuria occurred generally about one to two months later that those in Shanghai. It has been stated that there are no endemic centers of cholera in Manchuria, all outbreaks being traceable to importation from the south (Yang, 1928). However, the disease is so persistent in this country that it should be considered as a constant hazard to public health. The information on the cholera situation in Manchuria in recent years is incomplete. Kikuta (1937) reported 477 cases from the southeastern part of Liao-ning Province in 1934-1937. Three cases were reported from Ch'ang-ch'un (Hsinching) in 1937 (Abe and Kaneko, 1938). The official report shows that 21 cases with nine deaths occurred in the whole territory in 1938 (Manchoukuo Yearbook, 1941), and no cases were reported in 1939 and 1940. An unverified report indicates that cases of cholera occurred in 1942 and 1943. Rigid quarantine against cholera was carried out by the Japanese in the coastal harbors.

Tsuchiya and Yasumura (1930) stated that from the biological and immunological characters the strains of Vibrio cholerae prevailing in Ta-lien and Ying-kou in 1929 belonged to the so-called intermediate type. Manako (1933) reported that the result of both cross agglutination and the agglutinin absorption tests made on 167 strains of cholera vibrios in Manchuria during the summer of 1932 proved that most of them belonged to what is called the variant type. One strain from Ta-lien was found to be of the intermediate type and another strain from Mukden did not belong to either the intermediate or the variant type.

CHAPTER III

TYPHOID AND PARATYPHOID FEVERS

Due to general insanitary conditions, this group of enteric diseases is widespread and forms an important cause of morbidity and mortality in Manchuria. Yamada and Kawahito (1939) reported a death rate of 4.7, 5.7, and 2.6 per 10,000 population for typhoid and paratyphoid fevers among the Japanese in Manchuria for the years 1920-25, 1925-30 and 1932-35 respectively. The Manchoukuo Yearbook (1941) listed for the whole territory the following cases and deaths of typhoid and paratyphoid fevers:

Year	No. Cases	No. Deaths
1935	4,549	904
1936	4,628	1,004
1937	14,850	2,423
1938	5,207	468
1939	5,036	514

The case fatality rate ranged from 9.0 per cent in 1938 to 19.8 per cent in 1935. The Manshū Nenkan (1943) listed 7,141 cases of typhoid fever with 971 deaths and 1,341 cases of paratyphoid fever with 53 deaths in 1940. Cases of typhoid and paratyphoid fevers were reported throughout the year, but the highest incidence occurred in the months from August to December with the peak in October (Miura, 1926; Kawahito, 1933). They were principally diseases of middle-aged persons.

Notes on the Distribution of Typhoid and Paratyphoid Fevers. These diseases are common throughout the whole territory. Kawahito (1936) reported that the death rate among the Japanese population in Manchuria from 1925 to 1930 as 3.8 per 10,000 in Port Arthur, 5.5 in Ta-lien, 5.7 in An-tung, 3.5 in Ying-kou, 6.0 in An-shan, 8.2 in Liao-yang, 4.8 in Mukden, 7.3 in Fu-shun and 10.5 in Ch'ang-ch'un. In Ta-lien 65 cases of typhoid and 28 cases of paratyphoid fever were treated in the Pediatric Department, Dairen (Ta-lien) Hospital during a period of three years from 1922 to 1924. The majority of the cases occurred in October and November (Kawashima 1925, 1926). In the same department Kitahara (1932) recorded nine deaths with typhoid fever and one death with paratyphoid fever during 1925-1930, while the total number of deaths during the same period was 1,471. Urabe (1939) reported that 456 cases of typhoid fever were admitted to the Dairen (Ta-lien) Isolation Hospital in 1938. The incidence was highest in September among children and in October among adults. There were 102 deaths, representing a case fatality rate of 22.2 per cent. Tsuchiya and Nagata (1928) reported on typhoid fever in south Manchuria excluding the Kwantung Leased Territory. Over a period of ten years (1918-1927) 6,103 cases with 827 deaths were reported principally along the South Manchuria Railway Line, with a case fatality rate of 13.55 per cent. The disease was most prevalent during the period August to December. The seasonal distribution of the disease for the years 1925-1927 is given in Table 7.

TABLE 7

SEASONAL DISTRIBUTION OF TYPHOID AND PARATYPHOID FEVERS IN MANCHURIA IN 1925-1927

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
No. Cases:	91	80	52	68	49	107	115	246	303	401	332	203	2,047
Per Cent:	4.44	3.91	2.54	3.32	2.39	5.23	5.62	12.02	14.80	19.59	16.22	9.92	100.00

In the first four months of 1928, 141 cases of typhoid fever, and 191 cases of paratyphoid fever were reported along the South Manchuria Railway area. In Fu-shun alone there were 64 cases of typhoid fever and 132 cases of paratyphoid fever (Health Department, S.M.R. Co. 1929). The high incidence of paratyphoid fever was due to the epidemic of paratyphoid A in Fu-shun in that year. The reports of the League of Nations for the notifiable diseases showed the following records of typhoid and paratyphoid fever in the South Manchuria Railway Zone:

	1929	1930	1931	1932	1933	1934
Cases of Typhoid Fever	366	432	227	241	528	569
Cases of Paratyphoid Fever	179	266	103	128	173	160

In Mukden, Taylor (1935) of the Mukden College Hospital reported that the number of typhoid cases (131) treated in their hospital from 1929 to 1933 represented ten per 10,000 admissions, and that paratyphoid A cases (5) represented three per 100,000 admissions. The majority of the former and all of the latter were autochthonous cases. Toya (1933) reported 59 cases of typhoid fever occurring in the city in 1930-1932. Thirty-three (55.93 per cent) of these occurred in October and November. In the Isolation Hospital at Ch'ang-ch'un (Hsinching) there were a total of 2,886 admissions from May 1934 to April 1938; 406 were cases of typhoid fever and 94 were cases of paratyphoid fever, representing 14.07 and 3.25 per cent respectively. The population of the city in 1937 was 358,431. The majority of both typhoid and paratyphoid cases occurred among the people between the ages of 20 and 30 years. There were about twice as many infections of males as of females. The case fatality rate was 22.66 per cent for typhoid fever and 7.45 per cent for paratyphoid fever. Of the 81 paratyphoid cases classified 39 were paratyphoid A, 32 were paratyphoid B and ten were paratyphoid C (Abe and Kaneko, 1938). Kikuta (1938) of the Epidemic Prevention Corps of the Japanese Hsing-ching (Hsin-pin) garrison reported 352 cases of typhoid and paratyphoid fevers in Hsin-pin in 1935 while the total number of cases of the communicable diseases was 931. Cases occurred throughout the year with the highest incidence in February and March and lowest in September to

November (Kikuta, 1938). Lin and Wu (1927) reported 47 cases of typhoid fever during the first six months of 1926 in Pin-chiang (Harbin) which had a population of about 100,000. Twenty-five of the cases occurred in April. Kung (1928) reported 116 cases of typhoid fever in the city in 1927. An outbreak of typhoid and paratyphoid fevers was reported to occur in Tsitsihar in August 1943 with 50 to 60 cases among the civilians and about 100 cases in the Japanese army. The origin of the disease was reported to be contaminated vegetables which were washed in an infected pond.

All three types of paratyphoid fevers have been reported from Manchuria. Of the 28 cases of paratyphoid fevers occurring at Ta-lien as reported by Kawashima (1926), twelve were paratyphoid A and 16 were paratyphoid B. The former occurred from July to January and the latter from August to November. Male cases were twice as frequent as female cases for paratyphoid A, and three times as frequent for paratyphoid B. Nagata and Hayashi (1934) reported a serologically and bacteriologically proved case of paratyphoid C from Ta-lien. Hoshizaki (1927) reported a case of paratyphoid B in the Dairen (Ta-lien) Isolation Hospital, August 1927, indicating symptoms of ekiri. Matsubara (1928) reported an epidemic of paratyphoid A in Fu-shun in the first part of 1928, with about 130 cases. Of 36 strains of bacilli obtained from the Fushun Railway Hospital, 34 belonged to Bacterium paratyphosus A. The Health Department of the South Manchuria Railway Company (1929) reported the prevailing condition of the epidemic as being one case in January, six cases from the 1st to the 18th of February, 66 from the 19th of February to the 4th of March, and 54 cases from the 5th of March to the 4th of April. The number of cases greatly decreased afterward. Of the 94 cases of paratyphoid fevers reported by Abe and Kaneko (1938) from Ch'ang-ch'un in 1934-1938, 39 were paratyphoid A, 32 were paratyphoid B, ten were paratyphoid C, and 13 were unidentified to type.

Fukada (1938) stated that in Chien-tao (eastern Kirin Province) an "unknown fever" was reported and most of the cases were proved to be paratyphoid A. He claimed that the disease occurred sporadically in Jehol, but broke out among a Japanese cavalry brigade in Ch'i-feng in the middle of September 1933, resulting in 46 cases. Ten cases of bacteria carriers were discovered in the same brigade. Kurita (1938) reported 30 cases of paratyphoid C occurring among the Japanese soldiers in Manchuria in 1935-1936. Seven cases occurred in Ch'ang-ch'un, one in Yung-chi, five in Harbin, seven in Mukden, three in Kung-chu-ling, and seven in Hailar. With the exception of three cases in Mukden whose records were incomplete, five cases were reported to be fatal, representing a case fatality rate of 18.5 per cent. The seasonal distribution of the cases were as follows: three in March, one in April, two in June, four in August, two in September, seven in October, eight in November, two in December and one with an unknown date, indicating that the disease was more prevalent during the cold season. Isolation of the bacilli revealed that 24 were Bacterium cholerae-suis var. kunzendorf, five were American suipestifer and one was Bacterium typhi-suis var. voldagsen.

CHAPTER IV

PLAGUE

Plague is one of the most important infectious diseases in Manchuria and there have been frequent epidemics. These epidemics may be classified into two categories according to their origin.

1. Those epidemics which originated outside of Manchuria, such as the epidemics in 1910-1911, and 1920-1921. The epidemics usually spread all over Manchuria. The 1910-1911 epidemic started from Transbaikalia in the late fall of 1910, entered Manchuria through Man-chou-li and spread to Hailar, Harbin and Ch'ang-ch'un at the end of the year. Early in 1911 the epidemic included Mukden, Ta-lien, and Shantung with over 40,000 cases. The 1920-1921 epidemic also originated in Transbaikalia, infecting all of Manchuria but causing fewer deaths.

2. Those epidemics which originated from endemic foci within Manchuria. The epidemic of 1927-1928, for example, originated in the T'ung-liao region, and the epidemic in 1930 occurred along the Ssuping-chieh-Yaonan Railway Line and Chengchiatun-T'ungliao Railway Line. Epidemics of the first category occurred during the winter season and were pneumonic in nature, while those of the second category occurred from early summer to the end of autumn and were bubonic in nature. Case fatality rates were usually very high: 75-95 per cent for the bubonic type and nearly 100 per cent in the pneumonic type.

Plague in Mongolia and Transbaikalia is enzootic among the tarabagans (Marmota bobak = Arctomys bobak) and the principal vector is the tarabagan flea, Oropsylla silantiewi. Outbreaks of human plague in this area often started in late summer or autumn when people were camping in the field for hunting or harvesting. Under such conditions they came in close contact with rodents and their fleas. The disease in this region seems quiescent at present; there has been no information of human outbreaks since 1928. Nevertheless, a rodent reservoir probably persists, and outbreak of the disease is a constant hazard. The sylvatic reservoir of the disease in southern Manchuria is principally the common rat, especially Rattus norvegicus, and the main vector is the rat flea, Xenopsylla cheopis. The susliks, Citellus pygmaeus musicus and C. dauricus, are also suspected by some workers (Kurachi, 1930; Ando, Kurachi and Nishimura, 1931) to carry the disease.

In south Manchuria the port of Neu-chuan became infected with plague as early as 1899. The disease has reappeared in this city and the surrounding area many times. In T'ung-liao and other areas in south Manchuria several epidemics have occurred since 1924. Here the disease was thought to have been introduced from Inner Mongolia about 1917. In this region plague is predominantly of the bubonic type. In Chien-chiatien, northeast of T'ung-liao, 434 cases of bubonic plague were reported during the period September to November, 1928, of which 424 cases (97.7 per cent) were fatal. The population of the village was estimated at 1,300. Wu et al (1929) reported that 30 fatal cases resembling pneumonic plague had occurred in Nung-an District, Kirin, on December 14, 1928. In 1931 the South Manchuria Railway Company reported that plague was epidemic in K'ai-t'ung and T'ai-p'ing-ch'uan along the Ssu-Yao Railway, Tu-chuan (west of Yao-nan), Ta-lin along the Chinese Eastern Railway and Nung-an during the latter part of August 1930, resulting in about 200 cases. In 1933, plague broke out at the beginning of July in the northern part of the Nung-an District and subsided in November. About 42 villages in this area were infected by the epidemic and 624 deaths were reported (Hiroki, 1934). There was no marked correlation of mortality with age groups. The case fatality rate was over 90 per cent, and about 70 per cent of the deaths occurred within two or three days after the first symptoms of the disease. The epidemic was almost entirely bubonic in type, and only a few pneumonic cases were found at the close of the epidemic.

The Army Medical Corps of the Kwantung Army (1934) reported 1,306 cases of plague which occurred throughout Manchuria in 1933. The majority of the cases originated in Nung-an and T'ung-liao. In 1935, the disease spread to twelve counties (hsien), four banners (ch'i) and 59 villages (pulo) north of Nung-an in central Manchuria, causing 430 deaths from July to November (Yato, 1936). In Harbin, central Manchuria, the first epidemic in recent times occurred in the winter of 1910-1911 and lasted from November to February. The number of deaths was estimated to be 9,000, a death rate of 90 per 1,000. The second epidemic occurred in 1921, from January to May. A total of 3,125 deaths were reported with a death rate of ten per 1,000 (Chun, 1923). Both epidemics were almost exclusively pneumonic in type. As mentioned above, these epidemics originated in Transbaikalia and spread throughout Manchuria. Wei-ch'ang in Jehol Province was formerly another north China plague area. Although the plague season in this region occurred during July to November, the pneumonic type of the disease was conspicuous. About one third of the total cases in the 1896 outbreak were reported to be pneumonic, occurring mostly during the last one and one half months of the epidemic. The infection seems to have disappeared in this area in 1899. In November, 1933, an outbreak was recorded in the province in a locality north of Ch'ih-feng, but it was considered to have been imported from the T'ung-liao district and not of local origin.

In recent years the extent of plague infection in Manchuria is obscure. According to the 1941 Manchoukuo Yearbook there were throughout Manchuria 248 cases with 239 deaths in 1937, 718 cases with 687 deaths in 1938, and 657 cases with 500 deaths in 1939. No cases were reported in 1940 (Manshū Nenkan, 1943). The majority of infections reported occurred in the central part of Manchuria. It was reported that a village near Harbin was quarantined for bubonic plague during 1941-1944. The Manshū Nenkan of 1939 gave the distribution of 443 cases and 395 deaths during January to September 1938 as listed in Table 8.

TABLE 8

DISTRIBUTION OF PLAGUE IN 1938

Locality	Cases	Deaths
Tung-k'o central Banner	26	25
T'ung-liao hsien	7	7
K'ai-t'ung hsien	61	56
Hsin-hui hsien	47	37
Chan-yu (Kai-hua) hsien	21	17
Ch'ang-ling hsien	137	127
Koerlos front Banner	105	91
An-kuang hsien	39	35
Total	443	395

The localities for the cases that occurred in 1939 also centered in this region (Central Manchuria). It may be safely assumed that plague persists both endemically and epidemically in this region up to the present time. Yato (1936) reported that 88,707 persons in this area were inoculated for prevention of plague in 1935.

CHAPTER V

KALA AZAR

Kala azar, caused by Leishmania donovani and transmitted by sandflies (Phlebotomus) is widespread in China north of the Yangtze River. In Manchuria it constitutes one of the most important endemic diseases. It is particularly prevalent in south Manchurian villages situated along the coast of the Liao-tung Peninsula and the Liao River and other rivers flowing into the Po-hai Bay. The endemic area extends from the Kwantung Leased Territory north to Mukden, and west to Jehol Province. Cases have been reported in the cities along the Mukden - Talien Railway and the Mukden - Shanhaikuan Railway. According to Mo (1935) cases of the disease have also been reported from the northern part of Manchuria.

The earliest report of kala azar in Manchuria was in 1911 when Endo reported the probable contraction of the disease by a Japanese while visiting in Manchuria. In 1914 Saito reported the infection of a Chinese child in Lü-shun who was a native of Che-foo, Shantung. In 1917 one case was demonstrated at Mukden Meu's Hospital by splenic puncture. Mitsuse (1930) reported six suspected cases from Mukden in 1927-1929 including the isolation of L. donovani from a child who was a native of Fu-shun. Taylor (1931) reported several cases each year since 1920 occurring in Liao-yang, Ta-shih-chiao and Kai-p'ing along the Mukden - Talien Railway, with a few in Sui-chung and Kuang-ning (Pei-chen) along the Mukden - Shanhaikuan Railway. The same author (1935) again reported 31 cases treated at Mukden Hospital in 1929-1933, representing 23 per 100,000 admissions. The majority of these cases were believed to be autochthonous. Buto and Yamamoto (1934) reported the infection of a child native of Neu-chuang. Leishman-Donovan bodies were found particularly numerous in the reticular cells and also visible in the endothelial cells of the sinusoides. In 1934-1935, Mo made an intensive survey of the disease in Manchuria. Three regions in south Manchuria were investigated: viz., (1) the Kwantung Leased Territory centered at Chou-shui-tzu, (2) Fu-hsien and (3) Kai-p'ing-hsien with Hsiung-yueh-cheng as a center. The following cases were included in his report:

	True Cases*	Suspected Cases	Total
Ta-lien City	9	14	23
Lü-shun	1	11	12
Chou-shui-tzu Region	16	1	17
Fu-hsien Region	35	12	47
Hsiung-yueh-cheng Region	66	42	108
Liao-chung	1	0	1
	128	80	208

In Fu-hsien, four children were found to be suffering from this disease in one family. Most of the patients were below the age of 15 years and only ten were between the ages of 15 and 31. The disease is more prevalent in the lowland of the countryside than in the cities. Yosezato (1936) reported that cases of kala azar were found in the following localities along the Mukden - Shanhaikuan Railway Line: Shan-hai-kuan, Ta-ling-ho, Shih-shan-chan, Kou-pang-tzu, Lu-chia-tzu, Yang-shan, Pa-yuan-ying-tzu, Ch'ao-yang, Er-tao-ho-tzu, and Ch'eng-te (Jehol). Hayashi (1936) made histological studies on eleven cases of splenomegaly which had been diagnosed as Banti's disease and surgically extirpated at the Manchuria Medical College, Mukden, and found that three of the cases were kala azar infections.

Canine kala azar has not been reported from Manchuria although it is rather common in northern China. Andrews (1933, 1935) reported the first Chinese canine kala azar case in Shanghai and expressed the opinion that the infection was probably acquired in Mukden where the dog was born.

Recent research in the field of leishmaniasis has adequately demonstrated that the disease is transmitted by blood sucking insects. The only group of insects definitely shown to be vectors are the sandflies of the genus Phlebotomus. However, very little is known regarding the sandfly fauna of Manchuria, and Yang (1935) stated only that these insects are rare in Mukden. Mo (1935) questioned the sandfly theory of transmission in Manchuria, and Kubo, et al (1939) were of the opinion that the disease may be contracted from the feces of biting insects.

*Cases demonstrated by splenic puncture and positive serum reaction.

CHAPTER VI

MALARIA

Due to a cold climate and relatively unimportant mosquito vectors, malaria is not the serious health problem that it is in south China. However, the incidence of malaria in Manchuria has greatly increased in recent years. According to the Manchoukuo Yearbook (1941), 4,949 cases with 266 deaths were recorded by public clinics in 1935, and 5,655 cases with 342 deaths in 1937. The early history of the disease in this territory is obscure. According to the report of the Health Department, South Manchuria Railway Company, there were only a few reported cases of malaria in the cities and towns along the railway up to 1924. However, in 1924, the disease suddenly broke out in Tieh-ling where 255 cases of Japanese troops and 74 cases of civilians were reported (Hiyeda, 1933). In 1925-1930, about 0.9 to 1.9 per cent of the patients, treated in the Japanese hospitals in different localities along the South Manchuria Railway, were malaria cases, and about ten per cent of the mine workers in Fu-shun suffered from malaria. The incidence in other places however was much lower (Hiyeda, 1934, 1935). Taylor (1935) stated that malaria was definitely a menace to the health of certain communities in south Manchuria. Faust (1926) first noted that in the lower Amur River region malaria is highly endemic and estimated that about 30 per cent of the population was infected. Jettmar (1932) stated that there are two endemic foci of malaria in northern Manchuria: one between Lahasusu and Gaidikaudza at the lower end of the Sungari River, and the other a small swampy area between Aigun and Mergen. Ch'in (1939) also stated that in the northern part of Manchuria, especially the Sungari River region, malaria was more prevalent than other parts of the country.

According to Jettmar (1932) and Hiyeda (1932) vivax-malaria is the only form of the disease encountered in Manchuria. However, Iketani (1937) reported two cases of malariae-malaria from Ta-lien, Taylor (1935) two cases of autochthonous falciparum-malaria from mukden, and both types were reported from Harbin by Faust (1926) and Hayashi and Li (1936).

The mosquito vectors of malaria in Manchuria are not well known. Jettmar (1932) was the first to report the presence of Anopheles hyrcanus sinensis in north Manchuria, and suggested that it might be the malaria vector in that region. This species is common in southern Manchuria according o Hiyeda (1935) and Kitabatake (1935). In 1937, Feng and Ch'in reported the presence of A. labranchiae atroparvus at Hei-ho and Lung-cheng of northern Heilungkiang Province. A. messeae, a proven malaria vector, has also been reported to occur along the Amur River country. It is possible that all of these three species are responsible for the transmission of malaria in northern Manchuria.

Notes on the Distribution and Incidence of Malaria. Information regarding the incidence of malaria in Manchuria is extremely fragmentary. A report by the Health Department of the South Manchuria Railway Company concerning the incidence of malaria in 15 railway hospitals over a six-year period from 1925 to 1930 is summarized in Table 9 (Hiyeda, 1933).

TABLE 9

INCIDENCE OF MALARIA ALONG THE SOUTH MANCHURIA RAILWAY IN 1925-1930

Hospital	No. Cases	Per Cent of Total Admission
Lü-shun	80	0.7
Ta-lien	91	0.1
Ying-kou	28	0.2
Ta-shih-chiao	25	0.3
An-shan	224	2.2
Liao-yang	138	1.4
An-tung	116	0.8
Pen-chi-hu	64	0.8
Fu-shun	2,385	9.1
Mukden	280	0.8
Tieh-ling	110	1.7
Kai-yuan	74	0.8
Kung-chu-ling	10	0.1
Ch'ang-ch'un	36	0.2
Yung-chi (Kirin)	15	0.2

These data list mainly the records of Japanese. The number of malarial cases among the Chinese is considered many times higher. In An-shan and Fu-shun where many Chinese work in mines, the malaria incidence is much higher than in other places. It was estimated that about ten per cent of the Chinese in An-shan and Fu-shun were affected annually. In the region south of Kung-chu-ling there is a more or less increase of the disease each year particularly in Fu-shun and An-shan, while in the area north of Kung-chu-ling there is no tendency toward an increase of the disease. One of the principal factors responsible for this increase is thought to be the growth of cities with an expansion of industries.

Malaria in southern Manchuria is most prevalent during the months of June to October. The number of cases begin to increase in April, reach its maximum in August, and decrease abruptly in October. Table 10 gives the monthly distribution of the malaria cases in various localities of south Manchuria from 1925 to 1930 (Hiyeda, 1933).

TABLE 10

MONTHLY DISTRIBUTION OF THE MALARIA CASES IN VARIOUS LOCALITIES IN 1925-1930

	Lu-shun	Ta-lien	An-shan	Liao-yang	An-tung	Pen-ch'i-hu	Fu-shun	Mukden*	Tieh-ling	K'ai-yuan	Total
Jan	-	1	5	3	-	-	3	15	4	-	31
Feb	-	2	3	-	-	-	9	6	-	-	20
Mar	1	1	1	4	-	-	6	5	1	-	19
Apr	1	2	16	-	-	2	41	6	4	1	73
May	4	3	2	6	-	7	136	17	10	7	192
Jun	17	6	24	13	13	8	324	32	12	13	462
Jul	10	11	40	27	27	10	526	101	23	11	786
Aug	8	21	53	23	35	11	639	108	20	11	929
Sep	20	28	51	27	21	16	511	82	24	24	804
Oct	13	11	19	19	10	7	138	46	5	6	274
Nov	5	4	6	11	2	3	42	26	5	-	104
Dec	1	1	4	5	1	-	10	9	2	1	34
Total	80	91	224	138	109	64	2,385	453	110	74	3,728

*For a period of ten years from 1921 to 1930.

Official reports of malaria cases during 1935-1937 by the sanitation divisions of the local police departments are listed in Table 11 (Ch'in, 1938).

TABLE 11

DISTRIBUTION OF MALARIAL CASES IN 1935-1937

Locality	1935	1936	1937	Locality	1935	1936	1937
Mukden	813	431		Ming-shui	9	5	
Fu-shun	31	32	3	K'o-tung	12	13	
Liao-yang	58		28	Pai-chuan	82	24	
Pen-ch'i	58	154		Teh-tu	13	15	
Hai-cheng	4	6	4	Lung-chen	81	25	
Ying-kou	83	12	7	Ta-lai	2	17	
Fa-k'u	166	107	49	An-kuang	4	4	
K'ang-p'ing	31	44		Chen-tung	23	20	
Li-shu	61	121	27	K'ai-t'ung	17	7	
Ch'ang-t'u	172	8	11	Chan-yu	10	36	
K'ai-yuan	4		30	An-tung City		69	
Si-zeng	54	60	287	Feng-cheng		6	
Si-an	132	77	67	Chuang-ho		410	
Tung-feng	21	14	42	Hsiu-yen		37	
Hai-lung	116	460	61	Huan-jen		73	
Ch'ing-yuan	83	91	31	Chi-an		107	
Hsing-ching	31	15	58	T'ung-hua		11	
Liu-ho		12	15	Fu-sung		9	
Chin-chuan		18	6	Hei-ho		1	
Hui-nan	17	1	104	Chi-k'o	2	3	1
T'ai-lai	62			Mo-ho	25	72	36
Kan-nan	33	5		Ai-hun	12	4	
Fu-yu	13	1		Wu-yun		2	1
Lin-tien	17	2		Fo-shan			2
Na-ho	19	72		Chi-pu			55
K'o-shan	1	81		Hu-ma			8

In Mukden, 1,646 cases were reported in 1934. This record, though fragmentary, indicates that the disease is widespread. Nishihori (1932) reported that 18 per cent of the Japanese soldiers in Manchuria examined were found to be malaria carriers and five per cent were verified to carry P. vivax. In Ta-lien the malaria incidence is comparatively low, representing only 0.13 per cent of the total number of patients (Hiyeda, 1933). Iketani (1937) reported 54 cases of malaria treated at the Department of Internal Medicine, Dairen (Ta-lien) Hospital, over a period of six years from 1931 to 1936, representing only 0.07 per cent of the total admissions of 78,440 patients. All of the patients, with the exception of two, were Japanese, including three children. According to the author, anopheline mosquitoes are rather rare in Ta-lien and the patients possibly contracted the disease outside the city. From the hospital records it appears that all except four of the patients suffered from tertian malaria. Two patients showed a subtertian type of infection which was probably the result of reinfection of tertian malaria. Two others showed a quartan type. The majority of the cases occurred during July and August. Kitabatake (1935) investigated the parasitic

diseases among the Japanese immigrants in two villages (one near Chin-chou and the other near Ying-kou) in south Manchuria and stated that malaria is widely spread in these districts. Epidemics of malaria were confined to mid-summer, June to August. Several hundred of the inhabitants in the vicinity of these villages were infected in one epidemic. Blood samples of 64 persons from the village near Chin-chou were examined and six (9.3 per cent) infections with Plasmodium were observed. Fifteen malaria patients were examined from a neighboring village and reproductive bodies of Plasmodium were discovered from ten of them. Blood examinations of 122 persons were made at the village near Ying-kou, of which four were positive for parasites. Both larvae and adults of Anopheles hyrcanus sinensis were abundant in the villages.

In Mukden, Taylor (1935) reported 147 cases of malaria treated in the Mukden Hospital from 1929 to 1933 (two falciparum cases in 1934) representing eleven per 10,000 admissions. These include 144 cases of vivax-malaria, one case of malariae-malaria and two cases of falciparum. The majority of the vivax cases and one of the falciparum cases were autochthonous.

In Fu-shun the number of malaria cases was greatly increased after 1924. About 16.5 per cent of the patients in 1927 and 14.0 per cent in 1929 were malaria cases (Kudo, 1932). From 1928 to 1932, 8,832 cases were reported among 20,000 laborers in twelve mines in this region. The disease was prevalent during the summer months and ranked first to fourth in frequency of 56 diseases reported by the Labor Department of the Fu-shun Mining Company. Table 12 shows the monthly distribution of the disease in percentage of the total admissions of 56 diseases during 1929-1932 (Kitabatake, Yamamoto & Murase, 1934).

TABLE 12

MONTHLY DISTRIBUTION OF MALARIA IN FU-SHUN IN 1928-1932 (IN PERCENTAGE)

	1929	1930	1931	1932	Average
Jan	0.4	0.1	0.1	0.2	0.2
Feb	0.4	0.2	0.4	0.3	0.3
Mar	0.2	0.1	0.7	0.1	0.3
Apr	1.1	1.0	2.4	0.6	1.3
May	5.1	4.2	13.6	3.9	6.3
Jun	16.2	8.2	25.3	9.8	14.9
Jul	23.9	11.5	30.0	13.6	18.8
Aug	21.1	13.8	23.2	12.5	17.7
Sep	15.1	18.5	20.0	12.0	16.4
Oct	-	9.2	9.3	6.2	-
Nov	3.6	6.0	3.9	1.2	3.7
Dec	0.5	0.9	0.9	0.4	0.7

Blood examinations on 2,223 apparently healthy workers from two mines were made and 95 (or 4.3 per cent) of them were found to be gamete-carriers. The only Plasmodium found was P. vivax. The larvae of Anopheles hyrcanus sinensis became abundant after May (Kitabatake et al, 1934). Blood examinations were also reported at Tieh-ling, another industrial center in Manchuria. Blood specimens were taken from 841 persons from April to July 1924 and Plasmodia were found in 42 (or about five per cent) of them. (Health Department, S.M.R. Co., 1927). In Harbin, Lin and Wu (1927) reported 56 cases of malaria from January to June, 1926, representing 10.8 per cent of the total of 521 cases of infectious diseases.

In the northern part of Manchuria, Jettmar (1932) first noted two malaria endemic areas, one in the region below the confluence of the Sungari and Amur Rivers between Lahasusu and Gsidikaudza and the other in the swampy valley from Aigun to Mergen. Ch'in (1939) made a preliminary survey of malaria and mosquitoes in certain places of north Manchuria. Investigations of malaria were made at six places: viz., K'o-shan, Pei-an, Sun-chuan-kou (about 20 miles north of Pei-an), Teh-tu, Tu-lee-ssu (about six miles west of Teh-tu), and Hsu-er-tun (about 18 miles east of Teh-tu), with the following results:

Locality	No. Examined	Positive Cases	Percentage
K'o-shan	300	3	1.0
Pei-an	380	13	3.4
Sun-chuan-kou	104	17	16.4
Teh-tu	485	77	15.9
Tu-lee-ssu	112	40	35.7
Hsu-er-tun	167	70	42.0

These data were based on the clinical symptoms and past history of malaria of the native people examined. No blood or physical examinations were made. From this survey the author concluded that the regions near Teh-tu and Lung-chen along the Namor River were the most heavily infected among the places investigated.

One hundred thirty three (133) Anopheles hyrcanus sinensis (twelve from K'o-shan, 85 from Pei-an and 36 from Teh-tu) and three A. labranchiae atroparvus (two from Pei-an and one from Teh-tu) were collected and dissected for malaria parasites. These dissections were negative. Little is known regarding the malaria situation in other regions of Manchuria.

Malaria-vectors in Manchuria. Only two species of anopheline mosquitoes have been found in Manchuria, A. hyrcanus sinensis and A. labranchiae atroparvus. The former, A. hyrcanus sinensis, is widely distributed in the country and its adjacent territories. It is a very common mosquito and is probably the only malaria vector in the southern part of Manchuria. The larvae of this species are found in grass-covered stagnant water, such as swamps, drying rivers or streams, lakes, ponds, marshes, ditches, pools, rice fields, drains, large wells, and stagnant or slowly running water along the shores of streams, rivers or lakes. They breed occasionally in the water of artificial containers. The adult females enter houses and attack man as well as domestic animals. This mosquito is primarily zoophilic and attacks man only when other mammals are not available. In other parts of China where more important vectors are present it plays a relatively minor role in the transmission of malaria. But in south Manchuria where few other anopheline mosquitoes have been found it is the main vector of the disease.

Anopheles labranchiae atroparvus was first reported from Hei-ho and Lung-chen in Heilungkiang Province by Feng and Ch'in in 1937, and was again collected from Pei-an and Teh-tu in the same province by Ch'in in 1938. Since malaria is endemic in this region and atroparvus is an important malaria vector elsewhere it may be the vector of the disease in this region. However, as Feng's determination was based on a single specimen, the identity of the variety is still open to question. The larvae of atroparvus breed in ditches containing fresh water as well as in brackish water along coastal areas. Adult females have been taken from human dwellings. They readily attack man as well as domestic animals.

Anopheles messeae has been reported by Russian observers from Khabarovskiy Kray, Chitinskaya Oblast, and Buryat-Mongol'skaya, ASSR. It is possible that further investigation may reveal the presence of this species in Manchuria. This species is a proven malaria vector. The larvae breed in cool, fresh, standing bodies of water in large inland river valleys, lakes, and marshes. Adult females appear to prefer animal to human blood. They hibernate in barns and houses during winter months. It should be also noted here that two varieties, A. maculipennis lewisi and A. maculipennis selengensis were described by Ludlow from Selenga, Siberia in 1920. Recently Aitken (1945) suggested with reservation that "Falleroni's messeae (1926) originally described from Italy is in reality Ludlow's lewisi (1920) and should be known as A. maculipennis lewisi". A. maculipennis selengensis should then remain as a synonym of A. maculipennis lewisi.

Anopheles (Myzomyia) pattoni which has been shown to be a good experimental carrier of malaria and considered to be an important vector in the hilly regions in Shantung, Hopei and Szechwan provinces, has been reported as far north as Ch'in-huang-tao, south of Shan-hai-kuan. Its occurrence farther north in Manchurian territory is probable. Anopheles (Anopheles) lindesaii japonicus which is widely distributed in China and Japan, has been collected in Peiping. It is possible that this species is also present in south Manchuria. This mosquito has been regarded as a malaria vector of secondary importance in Japan.

CHAPTER VII

TYPHUS

Typhus is endemic and often assumes epidemic proportions in all parts of Manchuria. According to the Manchoukuo Yearbook (1941) there were 1,220 cases of typhus with 272 deaths in 1935, 4,496 cases with 763 deaths in 1936, 7,349 cases with 1,025 deaths in 1937, 1,395 cases with 209 deaths in 1938 and 1,577 cases with 254 deaths in 1939. The case fatality ranged from 13.9 per cent in 1937 to 22.3 per cent in 1935. Of these, 3.4 per cent were Japanese and 19.3 per cent Chinese. Manshû Nenkan (1943) listed 2,515 cases with 276 deaths in 1940. Both the classical type (louse-borne) and the murine type (flea-borne) are prevalent. The former frequently breaks out in various parts of the country and constitutes one of the major contagious diseases in this territory. The murine typhus which is better known as "Manchurian fever" in the Japanese literature is endemic throughout the country. A great deal of work has been done on this disease by Japanese workers regarding its etiology and epidemiology in recent years.

Early reports do not differentiate the types of the disease. In 1918 it was reported to be epidemic in Harbin due to crowding of refugees from the European war. There were usually 200 to 600 cases each year in this city (Chen et al, 1938). Ogawa (1929) at Fu-shun studied four typhus cases (Chinese mine workers) in 1915, and at Mukden one case in 1918 and one Korean case in 1919. The Kwantung Government statistical report gave 210 typhus cases in the Kwantung Leased Territory and 456 cases in the South Manchuria Railway Zone from 1922 to 1935 (Kikuta, 1937). The disease was reported to be epidemic in south Manchuria in 1928 especially in the area along the South Manchuria Railway. Over 1,000 cases were treated in the Dairen (Ta-lien) Clinic in that year. From 1934 to 1937, 119 cases were reported among Japanese troops stationed at different districts in the southeastern part of Liaoning Province. In 1934 the number of typhus cases in the Feng-tien Japanese Army Hospital was the most prevalent of all diseases (Kikuta, 1937, 1938). Kodama, Takahashi and Kawano (1932) reported 500 cases of Manchuria fever in a town of 15,000 population near Ta-lien in 1928. Todani (1933) reported 59 cases of typhus in Mukden over a period of two years. The disease seems to have two prevalent seasons a year, one from March to June and the other from September to December. The majority of the patients (43) were between 21 and 40 years of age. The author stated that two types of the disease existed in Manchuria, the endemic type (mild type) which occurred sporadically and the epidemic type (severe type) which occurred epidemically. Chen et al (1938) observed 136 cases of so-called Manchuria fever in the Manchuria Medical College Hospital during a period of three years from January 1933. Most of the patients were Japanese, 20-30 years of age. There were twice as many male patients as female patients. The highest incidence occurred during the months of September, October and November. Ozaki and Ohtsuka (1935) investigated the epidemiological aspects of the so-called Manchuria fever which prevailed in different regions in the city of Ch'ang-ch'un (Hsinching) in 1933. A total of 124 cases were studied, including 115 Japanese, five Koreans, three Chinese, and one Russian. Of 118 cases where ages were known, 73 were between 20 and 39 years of age. Only two cases were under seven years of age and one over 60. The rarity of reported cases among children was attributed to the mild nature of the disease in this age group, so that it is not often reported. Cases occurred throughout the year with two peaks, one in June and the other in October, the latter being by far the highest. A morbidity rate of 46.6 per 1,000 was reported. The authors observed that Manchurian rickettsia was detected in house rats and rat fleas collected in the homes of patients, as well as an intermediate type of the virus observed in human lice.

Kodama et al (1932) pointed out the dissimilarity between Manchurian typhus virus and typical typhus virus in experimental animals (guinea pig): (1) R. manchuriae does not always produce nodules in the brain of an infected guinea pig, and if at all, to a lesser degree than the typical disease; (2) the Neill-Mooser reaction is characteristic and strongly positive in R. manchuriae; (3) R. manchuriae may be detected in large numbers from the tunica exudation of an infected experimental animal.

Under natural conditions the two types of rickettsia are different. The rat is the host of R. manchuriae and the disease is transmitted by rat fleas and rat lice, while man is the host of R. prowazeki and the disease is transmitted by body lice. Passage of R. manchuriae in the louse tends to decrease the Neill-Mooser reaction, increase the virulence of the parasite, and cause the disease to assume the characteristics of classical typhus. Kodama et al (1932) reported that when three strains of R. manchuriae were experimentally passed through body lice (Weigl's method) for four generations, the characteristics of R. prowazeki were produced (false Neill-Mooser reaction). A cross immunity has been established for the Manchurian type, not only against itself but also against the typical typhus virus (Kodama et al, 1932).

On the other hand, Iwata (1938, 1939) studied the types of the disease in various parts of Manchuria and expressed a different view regarding the typhus types and their causative agents. The following account is based on his studies. He reported 30 cases treated in the Mukden Municipal Infectious Diseases Hospital from late in 1936 to September 1938. One was critically, two were moderately and 27 were mildly ill, and there were no fatalities. About 28 per cent of the cases were Japanese, while the remainder were Chinese. One hundred four (104) cases occurred during the epidemic in Chia-mu-ssu from January 19 to March 10, 1938. The population of the city was about 37,000. Before this epidemic, a small outbreak was reported at the prison of the Chia-mu-ssu Prefecture Public Office during the first week of December. There seemed to be a definite relation between the outbreak in the prison and the epidemic in the city, because the majority of the patients in the first stage of the city epidemic were policemen and others who had visited the prison and had contracted the disease shortly after. Following this incident, the disease spread throughout the city. Nine hundred seventy three (973) body lice collected during the epidemic were examined, of which 79, or 8.1 per cent, were infected with typhus virus. R. pediculi, which is not known to be pathogenic, was found in 29.7 per cent of the lice, and 4.5 per cent contained rickettsiae which were unidentified as to species. During an epidemic, centered in Fu-shun, 126 cases occurred in succession from the middle of December 1936 to January 16, 1937, of which twelve (9.5 per cent) were fatal. It seemed probable that the disease had been introduced from

the epidemic areas of the neighboring districts where there had been a conspicuous epidemic during the autumn of 1936. The author studied nine cases in the village of Ying-pan. All of these were Chinese ranging from 18 to 51 years of age, and seven were males. There were no child or infantile cases. Six of the patients were moderately and three critically ill. In two R. prowazeki was demonstrated, and in five strains of an intermediate form. Strains of R. manchuriae were not observed. In another epidemic which centered in southern Liaoning Province, over 5,000 cases occurred from the autumn of 1936 to the winter of 1937. The mortality was about 16.4 per cent. Of 27 cases studied, R. prowazeki was isolated from four cases, and a strain of an intermediate form from nine cases. No cases of R. manchuriae were encountered. Strains of the three types, R. prowazeki, R. manchuriae and the intermediate form, coexisted in the sporadic outbreak in Mukden. Of 20 strains which originated from this outbreak, one was that of R. prowazeki, five were of an intermediate form and 14 were R. manchuriae. In the Chia-mu-ssu epidemic, a similar distribution of typhus viruses had been observed. Clinical data and virus studies for 46 cases (20 from Mukden, 19 from Chia-mu-ssu and seven from Ying-pan) are compiled in Table 13.

TABLE 13

RELATION BETWEEN SYMPTOM OF TYPHUS AND TYPES OF VIRUSES

	R. manchuriae	Intermediate form	R. prowazeki	Total
Mild cases	17	8	0	25
Moderate cases	0	9	4	13
Critical cases	0	4	4	8
Total	17	21	8	46

Based upon his studies and those of others, Iwata arrived at the following conclusions:

1. Typhus fever virus may be classified as one of three types: the strain of Rickettsia prowazeki, the strain of R. manchuriae or R. mooseri, and the strain of an intermediate form.

2. The sporadic typhus virus is perhaps the original form and the epidemic virus its variety.

3. The three types may be classified by Neill-Mooser reaction and Maxcy phenomenon. These tests are usually negative to the epidemic typhus virus, positive for sporadic typhus virus, and intermittently positive for the intermediate form.

4. The strain of R. manchuriae is better suited for organ-peritoneal than blood-heart passage; the strain of R. prowazeki has greater affinity to blood-heart passage, and the intermediate is suitable for both passages.

5. Typhus fever is classified under three forms by clinical symptoms: mild, moderate and critical. There is a definite relation between the three forms of clinical pictures and the three types of typhus virus. R. manchuriae is, as a rule, isolated from the mild form, and the strain of R. prowazeki from the critical form.

In Mongolia the disease is also prevalent. During the period 1911 to 1920, 39 young missionaries died of typhus, and 23 during the period 1921 to 1930. Upon the introduction of Weigl's vaccination technique, only one death from typhus occurred among these missionaries during the period 1931-1940. This death was caused through failure of prompt delivery of vaccine (Chinese Med. Jour. Aug 1940).

The body louse, Pediculus humanus corporis, which is the vector of epidemic typhus fever, is very common in Manchuria, especially among the poor classes and refugees. Iwata (1939) collected 973 body lice during the epidemic of Chia-mu-ssu in 1938 and found that 79 (8.1 per cent) contained typhus virus, 279 (29.7 per cent) contained Rickettsia pediculi and 44 (45 per cent) contained Rickettsia unidentified to species. Kodama et al (1932) examined 240 rats (including 202 Rattus norvegicus norvegicus, four Rattus norvegicus hibernicus and one Rattus rattus alexandrinus) from two Chinese towns near Ta-lien during an epidemic of sporadic typhus in 1926. Of these, 16 were found to be definite carriers of R. manchuriae. All of the infected rats except one alexandrinus were norvegicus. The predominant species of fleas found on the rats were Xenopsylla cheopis and Monopsyllus anisus (Ceratophyllus), the former being more numerous and the only species infected.

CHAPTER VIII

OTHER ARTHROPOD-BORNE DISEASES

Relapsing Fever. Relapsing fever, caused by the spirochete Borrelia recurrentis and carried chiefly by the body louse, is common in Manchuria. The disease usually accompanies outbreaks of typhus fever. Cases have been reported throughout the country. During the first five months of 1938, 95 cases with 28 deaths were reported among the Chinese from the whole of Manchuria. In the Dairen (Ta-lien) Isolation Hospital 81 cases were treated from April to August, 1939. Of these, 72 (88.9 per cent) were male and only nine (11.1 per cent) were female, and 55 of the cases were between the ages of 21 and 40 years. Taylor (1935) reported 21 cases of relapsing fever treated in the Mukden Hospital from 1929 to 1933, representing 16 per 100,000 total admissions. One hundred sixty (160) cases were reported from Fu-shun in 1915 (Shrimpton, 1936). In Ch'ang-ch'un (Hsinching) there were several cases reported each year (Toki, 1936; Abe and Kaneko, 1938). Cases were also reported from An-tung (Hiroki & Toda, 1933) and from the city of Harbin (Kung, 1928) Miyabe (1938) reported that in the northern part of Heilungkiang Province there had been an unknown fever which was prevalent every year from January to May with a considerable number of deaths. An investigation of ten cases which occurred in Ai-hun (Aigun) and Hei-ho in March 1938 revealed a kind of spirochete in the blood of the patients. This organism, which was believed to be the cause of the disease, is morphologically very similar to B. recurrentis, and the disease was later determined as relapsing fever.

Tick-borne Typhus Fever. This disease has been reported in the far eastern part of the Soviet Union since 1936. Outbreaks have occurred in Vladivostok and in the areas of the Amur and Ussuri Rivers bordering upon Manchuria. It is caused by an undetermined Rickettsia and carried by ticks. Dermacenter nuttalli was found to be an important vector. Other ticks, such as Dermacenter silvarum, Haemaphysalis concinna, and Ixodes persulcatus, were also suspected to transmit the disease. Some species of rodents have been reported to be infected with the disease and suspected to be a natural reservoir. Cases occur from April to September with a peak in May. The disease has not been reported from Manchuria, but its occurrence in the northeastern regions is very likely.

Scrub Typhus. Scrub typhus (tsutsugamushi disease), caused by Rickettsia tsutsugamushi (or R. orientalis) and carried by the larva of the harvest mite Trombicula akamushi, is known to be endemic at Honshu Island, Japan and other regions of the Far East. It has not been known to occur in Mahchuria, but due to the widespread distribution of the disease its introduction into Manchuria is likely.

Japanese B Encephalitis. This disease has been epidemic in Japan, frequently involving several thousand cases. It has also been reported in the Maritime Krai of USSR in the regions bordering Manchuria. A small epidemic which was thought to have been of the Japanese B type was described from Peiping (Chu et al, 1940). The disease is caused by a virus and the mosquitoes, Culex pipiens and Culex tritaeniorhynchus are suspected as vectors. Cases have not been reported from Manchuria but both species of the mosquitoes have been found in Liaoning and Kirin Provinces. The disease may be readily introduced, if not already present, in Manchuria.

Tick-borne Encephalitis (Russian Spring-summer Encephalitis). Tick-borne encephalitis transmitted by Ixodes persulcatus, has been reported from various areas in the far eastern parts of the USSR. Neither the disease nor its vector has been reported from Manchuria, but its introduction is probable.

Dengue Fever. Dengue fever appears periodically along the south China coast and extends northward during the warm season. However, cases of the disease have not been definitely reported from as far north as Manchuria. Tournier and Guénolé (1928) reported twelve cases in a small epidemic which occurred among the Annamese riflemen of the French garrison in Shan-hai-kuan from the 4th to the 23rd of February, 1928. It is doubtful that this was an epidemic of dengue fever and furthermore it is possible that none of the cases were contracted locally as the described "epidemic" occurred during the time of season when the mosquito vector is absent. The mosquito vectors Aedes aegypti and A. albopictus are rather widely distributed in China. While the former is principally a southern species the latter has been recorded as far north as Peiping. It is possible that its range extends further north into Manchuria.

Filariasis. No autochthonous cases of filariasis have been reported from Manchuria, although the mosquito vectors, Culex pipiens pallens and C. tritaeniorhynchus have been found in Liaoning, and Anopheles hyrcanus sinensis occurs in all parts of the country. Dirofilaria immitis was demonstrated in eleven of 60 dogs in Mukden, representing an infection rate of 18.3 per cent (Yamane, 1938).

Sandfly or Pappataci Fever. Kitahata (1939) reported that this disease is present in Jehol and in the region along the Mukden - Shanhaikuan Railway Line. Its distribution in Manchuria is similar to that of kala azar. Further confirmation regarding this report has not appeared in the literature.

CHAPTER IX

TUBERCULOSIS

Tuberculosis is one of the most serious menaces to public health in Manchuria. All forms of infection were observed with the pulmonary type most frequently encountered. According to Yamada and Kawahito (1939), the death rate due to tuberculosis among Japanese in Manchuria during 1920-1935 was 16.2 to 21.5 per 10,000 population, with 11.2 to 16.0 per 10,000 for pulmonary tuberculosis. The highest mortality occurred in the age groups of 15 to 24 years and 60 to 70 years. Honma (1927) stated that the morbidity rate for pulmonary tuberculosis among the adult Japanese in Ch'ang-ch'un was calculated (based on the record of Ch'ang-ch'un Hospital) as 384.9 per 10,000, for Mukden 340.6, for Ta-lien 241.0, and for An-tung 225.2. From these rates it was calculated that 600 adult Japanese in Ch'ang-ch'un, 2,792 in Mukden, 2,064 in Ta-lien and 457 in An-tung, totaling 5,913, suffered from tuberculosis annually. Similarly, an estimated 1,056 Japanese children in Manchuria contracted pulmonary tuberculosis. Based on data compiled by the Kwantung Government, it was calculated that an annual average of 5,582 cases of pulmonary tuberculosis existed among the Japanese in Manchuria with a morbidity rate of 274.3 per 10,000. The disease occurs in all seasons but appears to be more prevalent during the first half of the year. Iwamoto (1938) reported that out of about 40,000 patients treated in the Hsinching (Ch'ang-ch'un) Railway Hospital over a period of three years from 1935 to 1937, 7.9 per cent were tuberculosis cases. These cases constituted 13.0 per cent of the patients treated by the Department of Internal Medicine. More than half of the tuberculosis patients were 20 to 39 years of age. Hirose (1938) reported that 377,682 patients were attended by all the "public physicians" in the whole territory from 1934 to 1937, of which 10,339 were tuberculous cases representing 2.74 per cent of the total.

All forms of tuberculosis are represented in Manchuria. Okada (1940) reported that 195 cases of genital tuberculosis (mostly Japanese) were treated in the Clinic of Dermato-Urology of the Dairen (Ta-lien) Hospital during a period of about 16 years. Teramoto (1927) reported that 422 out of 25,031 outpatients in An-tung Hospital were cases of tuberculosis of joints, representing 1.6 per cent of the total.

Mantoux tests have been made on various groups of people in Manchuria and a high percentage of positive reaction is indicated in all cases. Iio et al (1937) reported that 22,815 Japanese and 11,966 Chinese from 51 primary and secondary schools in Ta-lien and its adjacent villages, representing 87.83 per cent of the total student population in this area, were tested by the Mantoux method. The results of these facts were given in Table 14.

TABLE 14

RESULTS OF MANTOUX TESTS ON STUDENTS IN TA-LIEN AND VICINITY

		MALE			FEMALE		
	Age	No. Tested	No. Positive	Per Cent Positive	No. Tested	No. Positive	Per Cent Positive
Japanese	6-13 yrs.	7,666	2,521	32.89	7,320	2,375	32.45
	Above 13 yrs.	4,325	2,382	55.08	3,504	1,683	48.03
	Total	11,991	4,903	40.89	10,824	4,058	37.49
Chinese	6-13 yrs.	5,075	2,763	54.44	2,335	1,282	54.90
	Above 13 yrs.	3,540	2,247	63.47	1,016	632	62.20
	Total	8,615	5,010	58.15	3,351	1,914	57.12

Endo et al (1938) studied tuberculosis among the school children in Ta-lien. Altogether 995 children from seven schools were tested, and 268 (26.9 per cent) gave a positive reaction. Yamada (1938) reported the Mantoux tests on 623 Chinese students from K'uan-tien and T'ai-p'ing-shao in the southeastern part of Liaoning Province. The percentage of positive reactions is higher among the older students (ages 15-23) than among younger students (ages 7-14), being 47.8 and 39.8 respectively. In Mukden, Nakamura et al (1938) examined 294 Chinese primary school teachers between the ages of 20 and 45 years for tuberculin reaction during July 1937, and found 288 (98.0 per cent) to be positive. Microscopic examination of sputum was conducted for 202 of the teachers and tuberculous bacilli were found in eight cases (3.9 per cent). Akizuki et al (1940) examined 1,453 applicants for employment at a certain company in Ta-lien city for tuberculosis and reported that 75.8 per cent were positive for tuberculin reaction, and 9.6 per cent required further care or treatment for their infection.

CHAPTER X

ACUTE RESPIRATORY DISEASES

Pneumonia. Pneumonia (of all types) is one of the important respiratory diseases in Manchuria and often complicates influenza cases and other respiratory infections, resulting in high mortality. Yamada et al (1939) showed that the death rate due to pneumonia and bronchitis among the Japanese population of Manchuria during 1932-1935 was 16.5 per 10,000, while that of all respiratory diseases was 24.6. (The death rate of bronchitis alone was 2.7 per 10,000). Kitahara (1933) reported 362 infant deaths from pneumonia and pneumonia complications in the Pediatric Department, Ta-lien Hospital in 1925-1930, representing 25.5 per cent of the total deaths during this period. Takeyama (1938) reported 125 cases of pneumonia treated in the Manchuria Medical College during a period of five years from 1933. Of the cases, 106 were lobar pneumonia, 16 catarrhal pneumonia and three deglutition pneumonia. There were about twice as many male cases as female cases. The mortality rate of this series was about 30 per cent. The Manchoukuo Yearbook (1941) listed 1,932 cases of pneumonia with 329 deaths as reported by public clinics throughout Manchuria in 1935, and 2,959 cases with 225 deaths in 1937. The disease persisted throughout the year but was more prevalent from December to June.

Influenza. Influenza is very prevalent in Manchuria. This disease caused a death rate of 1.6 per 10,000 among the Japanese in Manchuria in 1932-1935 (Yamada & Kawahito, 1939). It headed the list of diseases resulting in infant mortality at Dairen (Ta-lien) Hospital from 1918 to 1923 (Suzuki, 1924). An epidemic of the disease started in Lü-shun at the end of 1927 and extended to April 1928, involving 271 cases with 14 deaths (Migai, 1928). In Ch'ang-ch'un, out of 2,754 cases of infectious diseases treated at the Railway Hospital from April 1933 to March 1934, 1,778 were reported to be influenza cases representing 64.4 per cent of the total (Ozaki & Ohtsuka, 1935). Offical reports (Manchoukuo Yearbook 1941) show that throughout the territory of Manchuria 44,096 influenza cases were treated at public clinics with 2,309 deaths in 1935, and 98,718 cases with 9,751 deaths in 1937. Although cases occurred in every month of the year, the disease was much more prevalent during the winter and early spring months, starting about December, with the number of cases gradually increasing until a peak was reached in March.

Bronchitis and Pleuritis. Bronchitis and pleuritis are also common respiratory diseases in Manchuria. The death rate due to bronchitis was reported to be 2.7 per 10,000 among the Japanese population in Manchuria in 1932-1935, and 2.3 per 10,000 for pleuritis (Yamada et al, 1939). The incidence of pleuritis in the Japanese army in Manchuria was 17.1 to 45.5 per 1,000, according to Nishihori (1932). Jono and Iketani (1937) observed 738 cases of the disease treated in the Dairen (Ta-lien) Hospital over a period of five years, representing 9.13 per cent of the total admissions. About 78 per cent of all the cases were between the ages of 15 and 25 years. The case fatality of this series was about 7.1 per cent. Tsukamoto et al (1938) noted 559 cases treated in the Takamori Laboratory of Internal Medicine, Manchuria Medical College, from 1930 to 1937. Iwamoto (1938) stated that 2.1 per cent of the patients treated at the Railway Hospital in Ch'ang-ch'un were pleurisy cases. The disease occurred throughout the year, but the incidence was highest during the months of April to July and lowest during the months of October, November and December.

CHAPTER XI

MISCELLANEOUS ACUTE INFECTIOUS DISEASES

Diphtheria. Diphtheria is a common disease in Manchuria. Yamada and Kawahito (1939) showed that the death rate of the disease was 0.8 per 10,000 Japanese population in Manchuria in 1932-1935. The highest death rate, 3.6 per 10,000, occurred among 1-4 year old children. Official sources show that in the whole territory there were 312 cases with 77 deaths in 1935, 238 cases with 43 deaths in 1938, 1,179 cases with 191 deaths in 1939 (Manchoukuo Yearbook, 1941) and 1,523 cases with 201 deaths in 1940 (Manshu Nenkan, 1943). The case fatality rate ranged from 16.2 per cent to 28.1 per cent. In Ta-lien, 1,407 cases of diphtheria were reported during a period of ten years ending 1933. The case fatality rate was 7.16 per cent among the Japanese and 36.36 per cent among the Chinese (Oga, 1933). The disease occurred throughout the year but was most prevalent during the cold season with the peak in November to February. Abe and Kaneko (1938) reported 176 cases in Ch'ang-ch'un from 1934 to 1937. The highest incidence occurred among children under the age of ten, and the case fatality ranged from 2.08 per cent in 1936 to 13.95 per cent in 1935 with an average of 7.95 per cent. Kung (1928) reported eleven cases of the disease in the city of Harbin and its vicinity in 1927. According to the League of Nations report, there were about 100 cases of the disease each year in the Chinese Eastern Railway Zone.

Scarlet Fever. Scarlet fever is regarded as an endemic disease in Manchuria and is one of the most important contagious diseases of children. Epidemics of the disease occur periodically. During an epidemic in 1916, 209 cases with 35 deaths were reported in the South Manchuria Railway Zone. The disease again assumed epidemic proportions during the latter part of 1925. Five hundred eighty two (582) cases and 66 deaths were reported along the railway area in 1925 (Ozaki, 1930). From December 1925 to January 1926, 615 cases were observed at the Dairen (Ta-lien) Clinic (Moriwaki et al, 1927). During this epidemic the morbidity and mortality among the Japanese in Manchuria were reported to be the highest in the world. The epidemic subsided during 1929 to 1931, but recurred in 1932. Kawahito (1936) gave the death rate of scarlet fever per 10,000 Japanese population in Manchuria as 5.1 in 1925, 7.8 in 1926, 1.9 in 1927, 1.6 in 1928 and 1929 and 1.1 in 1930. The average death rate in different localities of Manchuria is summarized in Table 15.

TABLE 15

DEATH RATE DUE TO SCARLET FEVER AMONG THE JAPANESE IN MANCHURIA FROM 1925 TO 1930

Locality	Death Rate (per 10,000)
Port Arthur	2.7
Ta-lien	2.4
An-tung	6.0
Ying-kou	4.9
An-shan	1.4
Liao-yang	6.3
Mukden	2.9
Fu-shun	2.1
Ch'ang-ch'un	6.2

Table 16 was compiled from the official reports (Manchoukuo Yearbook, 1941 and Manshū Nenkan, 1943) of cases and deaths due to scarlet fever for Manchuria during the years 1935-1940.

TABLE 16

CASES OF SCARLET FEVER AND DEATHS DURING 1935-1940

Year	No. Cases	No. Deaths	Fatality Rate
1935	1,844	314	17.0
1936	1,102	217	19.7
1937	1,442	269	18.5
1938	1,947	244	12.5
1939	1,303	248	18.0
1940	1,650	167	10.1

In Ta-lien there was a total of 1,396 reported cases with 52 deaths in 1930-1934 (Yokoyama, 1937). Dick tests were made on 472 persons at Ta-lien, 454 Japanese and 18 Chinese, of which 34.9 per cent of the former and 5.6 per cent of the latter gave positive reactions (Nishihori, 1932). Kikuta (1938) reported 28 cases of scarlet fever in Hsin-pin (Hsingching) in 1935. In Ch'ang-ch'un, 160 cases were reported in 1934, 132 cases in 1935, 103 cases in 1936 and 196 cases in 1937, representing an average morbidity rate of 1.9 per 1,000 population. The highest incidence was in March 1935 and May 1937. The majority of the cases were below 15 years of age, and the average case fatality rate was 12.18 per cent (Abe and Kaneko, 1938). Kuan (1930) claimed that in Harbin this disease was the main cause of death during the fall and winter. More deaths occurred among children than among adults. Kung (1928) reported 649 cases of the disease at Harbin and its vicinity in 1927, representing the greatest number of infectious diseases reported. Kunitake (1939) reported that 139 cases were treated in the Pediatric Department of the Harbin Municipal Hospital from 1936 to 1938. Nineteen (or 13.6 per cent) of the cases were fatal. Lin and Jettmar (1925) showed that out of 1,275 Dick tests made on the Chinese population in this city, 47.7 per cent gave positive reactions. The seasonal prevalence of the disease varies with different years. In general, the disease in Manchuria is on the increase from late autumn, remaining prevalent until the following summer.

Smallpox. Smallpox is still an important communicable disease in Manchuria. The disease was epidemic about every five years and was pandemic in 1933-1934. The epidemic started in October and extended to the end of May in the following year. At Ta-lien alone 571 cases were reported during this epidemic. The case fatality rate was 10.2 per cent among the Japanese and 17.0 per cent among the Chinese (Yamatsuta, 1934). The disease was epidemic in northern Korea in 1938 with more than 1,000 reported cases, spreading northward into Manchuria. In Mukden the number of cases greatly increased in December 1938 and began to decrease in July 1939. About 100 cases were reported in the city in 1939, 55 of which occurred in January. The case fatality rate was 8.7 per cent (Mochizuki and Koreeda, 1940). Kawahito (1936) reported that the death rate among the Japanese population in Manchuria due to smallpox was 2.5 per 10,000 in 1925 and 0.1 in 1930. Official sources (Manchoukuo Yearbook 1941; Manshū Nenkan, 1943) listed the following data concerning the prevalence of the disease during recent years throughout Manchuria (Table 17):

TABLE 17

SMALLPOX IN MANCHURIA IN 1935-1940

Year	No. Cases	No. Deaths	Fatality Rate
1935	1,629	341	20.9
1936	1,749	441	25.1
1937	3,064	452	14.8
1938	1,345	171	12.7
1939	1,005	148	14.8
1940	1,490	241	16.2

A program of country-wide vaccination was carried on since 1934. Within a period of five years ending 1938, a total of 13,082,783 persons were vaccinated, representing about 34.2 per cent of the entire population (Manshû Nenkan, 1940).

Chickenpox. Chickenpox is common and widespread. Ozaki and Ohtsuka (1935) reported 35 cases treated at the Ch ang-ch'un Railway Hospital from April 1933 to March 1934. Kung (1928) listed 42 cases observed in Harbin and its vicinity in 1927. The report of the League of Nations showed 1,390 cases of the disease in the Chinese Eastern Railway Zone from 1927 to 1934. The Manchoukuo Yearbook (1941) listed 2,681 cases treated by public clinics throughout Manchuria in 1935, and 3,425 cases in 1937. The case fatality rate was reported to be 18.2 to 19.8 per cent, which is much higher than would be expected.

Measles. Measles is an appreciable cause of mortality in Manchuria and ranks as the fourth most important disease among infants. Yamada and Kawahito (1939) reported that the death rate due to this disease was 7.2 per 10,000 Japanese population in Manchuria during the period 1920-1925 and 2.5 during 1932-1935. The incidence begins about February and continues into August, becoming most prevalent during the months of April to June. Morita (1936) showed that 4,749 cases of measles among children were treated at the Dairen (Ta-lien) Hospital during a period of 20 years (1912-1931). The case fatality rate was eleven per cent among the out-patients, and 23 per cent among the in-patients. Shima (1924) reported that a measles epidemic broke out in Fu-shun towards the end of 1923, causing 303 cases with 31 deaths. The most frequent complications in about 20 per cent of the cases were pneumonia and bronchiolitis. The Manchoukuo Yearbook (1941) listed 5,540 cases with 1,269 deaths at public clinics in Manchuria in 1935, and 9,665 cases with 1,663 deaths in 1937, with a case fatality rate of 23.4 and 17.2 per cent respectively.

German Measles (rubella). This disease is not uncommon in Manchuria and occasionally assumes epidemic proportions. It was epidemic in Ta-lien in 1923 following an epidemic of ordinary measles during the preceding months of November, December and January. The epidemic started suddenly in March after the other epidemic had subsided. Altogether 85 cases were observed in the Children's Clinic, Dairen (Ta-lien) Hospital during the year, of which 74 occurred from March to May (Suzuki, 1923). Ninety four cases were reported at the Railway Hospital at Ch'ang-ch'un from April 1933 to March 1934 (Ozaki et al, 1935). The disease was most prevalent among children under five years of age.

Whooping Cough. Whooping cough occurs throughout Manchuria. Yamada et al (1939) reported that this disease caused 1.9 deaths for every 10,000 Japanese in Manchuria from 1932 to 1935. The Manchoukuo Yearbook (1941) reported 11,505 cases with 1,034 deaths at the public clinics in Manchuria in 1935, and 21,457 cases with 1,672 deaths in 1937. Whooping cough cases are often complicated with pneumonia. The disease generally begins in early summer and reaches its maximum in August.

Mumps. Mumps is probably widespread in Manchuria, although available statistics are meagre. Kung (1928) reported 69 cases in the city of Harbin and its vicinity in 1927. The Manchoukuo Yearbook (1941) listed 4,416 cases with 219 deaths recorded at public clinics in 1935 and 3,595 cases with 167 deaths in 1937.

Erythema Infectiosum. Erythema infectiosum (the fifth disease) has been reported from Manchuria. The disease was epidemic in Ta-lien from the end of December 1926 to July 1927 when 164 cases were observed at the Dairen General Hospital (Hoshi, 1927). Kataoka reported 38 cases from Fu-shun in 1922, Fuwa 18 cases from An-shan in 1930, and Akazawa 20 cases from Mukden in 1931 (Sano et al, 1934). Sixty six (66) cases occurred at Ta-lien city from November 1932 to April 1933. Sixty four (64) of the cases were children under 13 years of age, and two were older than 15 years (Maki et al, 1933). The disease was prevalent during the cold season, especially from December to February. Incubation periods varied from six to 19 days, and in most cases ranged from eleven to 14 days.

Cerebrospinal Meningitis. Cerebrospinal meningitis is a rather common disease in Manchuria. Kawahito (1936) reported a death rate of 0.7 per 10,000 Japanese population in Manchuria in 1926, and 1.4 in 1927. Table 18 is compiled from official sources (Manchoukuo Yearbook, 1941; Manshû Nenkan, 1943) listing the cases of cerebrospinal meningitis and deaths reported from Manchuria during the years 1935-1940.

TABLE 18

CEREBROSPINAL MENINGITIS IN MANCHURIA FROM 1935 TO 1940

Year	No. Cases	No. Deaths	Fatality Rate
1935	426	35	8.2
1936	185	40	21.6
1937	103	20	19.4
1938	193	32	16.6
1939	191	68	35.6
1940	359	134	37.3

The case fatality rate ranged from 8.2 per cent in 1935 to 37.3 per cent in 1940. The disease occurs principally during the first six months of the year and especially from March to June. Kao (1936) noted that during a small epidemic of the disease in Mukden in 1933, 78 per cent of the cases were under 15 years of age and 58 per cent were under five years of age. The fatality rate was 40 per cent.

Poliomyelitis. Poliomyelitis has been reported from Manchuria but detailed information concerning its incidence and distribution was not available. Yamada and Kawahito (1939) reported an average death rate of 0.05 per 10,000 among the Japanese population in Manchuria from 1932 to 1935. The death rate was much higher among children between the ages of one and 14 years than among the older persons, being 0.14 and 0.01 per 10,000 respectively. More than twice as many females died from the disease as males.

Epidemic Encephalitis (Encephalitis A, Encephalitis lethargica). Encephalitis has been reported in Manchuria and seems to be widespread. Yamada and Kawahito (1939) gave the death rate due to this disease as 0.03 per 10,000 Japanese population in Manchuria in 1932-1935. The prevalence of the disease in

Ta-lien is better known. In this city, as in Japan, the disease occurred in 1920 and 1924 with ten cases reported for each year. From 1919 to 1926 a total of 31 cases were reported, 24 of which were between the ages of 21 and 40 years (Ochiai, 1931). The disease in Ta-lien, unlike in other areas, seldom occurred in summer but was most frequent during the cold months from September to March. Yokoyama (1937) listed two additional cases in the city, one each in 1931 and 1933. According to the report of the League of Nations, six cases were reported in the South Manchuria Railway Zone in 1929, and 74 cases with 31 deaths in the Chinese Eastern Railway Zone from 1927 to 1933, the average case fatality being about 42 per cent.

Undulant Fever. Undulant fever seems to be widespread in the western part of Manchuria where cattle and goats are raised in great numbers. During the spring of 1936, an outbreak of the disease was first reported from a goat farm in the neighborhood of Linhsi in the northwestern part of Jehol Province. Twenty one (21) cases were reported. Brucella melitensis was cultured from the blood of one patient. Since all of the patients reported that raw milk or raw dairy products had not been eaten, it was assumed that the disease was contracted through contact with infected goats. It was reported that infectious abortion was prevalent among the goats of that farm from January to March (Saiki et al, 1939). At one cattle farm in the same area 132 out of 292 cattle, and nine (26 per cent) of 34 employees were found to be infected. On a cattle farm in Ta-erh-han in northern Liaoning Province, eleven of 62 cattle were found infected, and B. abortus strain was cultured from one animal. Four of 59 employees at this farm were infected with the disease. Both animal and human infections were found at Paicheng-tzu and Ou-li in northern Liaoning. In Mukden, Taylor (1935) reported one human case of undulant fever treated at the Mukden Hospital in 1930. Saiki reported seven cases of the disease during a period of ten months. One of these was a laboratory infection, four contracted the disease from infected cattle, and in the remaining two cases the cause of infection was uncertain (Saiki et al, 1939). No animal infections were reported from Mukden.

Weil's Disease (Spirochetal jaundice). Epidemics of the disease have been reported from north China, such as in the provinces of Hopei and Shantung which are adjacent to Manchuria (Maxwell, 1929). The epidemiology of this disease in Manchuria is uncertain. Yamada and Kawahito (1939) reported a death rate of 0.01 per 10,000 Japanese population in Manchuria during the period 1932-1935 due to this disease. Information regarding other leptospiroses in Manchuria was not available.

Erysipelas. Erysipelas, caused by Streptococcus erysipelatis, seems to be common in Manchuria. Yamada and Kawahito (1939) reported a death rate of 1.3 per 10,000 population among the Japanese in Manchuria from 1932 to 1935. The incidence was much higher among infants, with a death rate of 17.9 per 10,000 among children under one year of age. Ozaki and Ohtsuka (1935) reported 41 cases of the disease treated at the Ch'ang-ch'un Railway Hospital from April 1933 to March 1934. Kung (1928) listed 36 cases in Harbin and its vicinity in 1927. The disease occurs throughout the year but it is more prevalent in the cold season from November to April.

Trachoma. Trachoma is a very common disease in Manchuria. It is believed that the disease occurs in about one half to two thirds of the Manchurian population. Wang (1935) examined 65,800 Chinese in Manchuria and found 66.02 per cent of them infected. The infection rate was higher among women (68.17 per cent) than among men. Kurihara (1939) examined 476 school children in Chin-hsien and found that 240 (or 50.4 per cent) were positive for the disease. Morbidity was found to increase markedly in children with an advance in age. Taylor (1935) reported 8,175 cases treated in the Mukden College Hospital from 1929 to 1933, representing more than six per cent of the total admission. Public clinics in Manchuria recorded 13,538 cases of trachoma in 1935, and 31,028 cases in 1937 (Manchoukuo Yearbook, 1941).

Tetanus. This is a fairly common infection in Manchuria with a death rate of 0.05 per 10,000 among the Japanese population (Yamada et al, 1939). Ommyoji and Chü (1929) demonstrated tetanus bacilli in three of 240 soil samples collected in Mukden, as well as from the feces of a monkey, a pig and a goat. The Manchoukuo Yearbook (1941) listed 2,597 cases with 198 deaths in 1935, and 1,782 cases with 304 deaths in 1937 as reported from public clinics in Manchuria. The case fatality rate was 7.8 per cent for 1935 and 17.1 per cent for 1937.

Rabies. Rabies is rather common in Manchuria. Nine hundred sixty six (966) persons were bitten by rabid dogs in the Kwantung Leased Territory and the South Manchurian Railway Zone during 1925. The number of persons bitten by rabid dogs in 1926 was 742, of which 229 were reported from the city of Ta-lien (Nishikawa, 1928). In 1935, 410 rabid cases were treated at public clinics, and 391 cases in 1937. Of these, 86 cases in 1935 and 59 cases in 1937 were fatal (Manchoukuo Yearbook, 1941).

Anthrax. Anthrax is endemic in Manchuria and has caused the death of several thousand animals annually. The disease is especially common in the northern and western parts of the country where cattle, horses and goats are being raised extensively. Human infections were caused either by direct contact with living animals or by handling hides and wool. Eleven human cases were reported from Kan-nan-hsien, Heilungkiang Province from 1934 to 1935 (Oishi et al, 1938). Imamura (1937) reported more than 50 human cases among railroad laborers of the Pei-Li Railway Line. The report of the League of Nations listed 18 cases in the Chinese Eastern Railway Zone from 1927 to 1934. One fatal case occurred in 1932 and two in 1933.

Glanders. Glanders due to Actinobacillus mallei is primarily a disease of horses and is communicable to man. The disease is reported to be common among horses in Manchuria. Report on human infection is rather meagre. Mochita first reported human infection with this disease in south Manchuria in 1931. Mori (1937) studied four cases treated in the Hirayama Surgical Laboratory of the Manchuria Medical College. Two of the patients were veterinary surgeons and the other two contracted the disease in the laboratory. Two of the four cases were fatal. In view of the prevalence of the disease among horses and the lack of medical care in rural districts, human infection with glanders is possibly much more prevalent in Manchuria than the available data would indicate.

CHAPTER XII

VENEREAL DISEASES

Venereal diseases are prevalent in Manchuria and constitute one of the most important groups of infectious diseases. Official reports show that of 157,401 prostitutes examined, 4,281 were infected with syphilis, 17,570 with gonorrhea, and 3,387 with chancroid (Manshû Nenkan, 1937). The Manchoukuo Yearbook (1941) listed 15,504 cases of syphilis and 15,815 cases of gonorrheal diseases treated by the public clinics in Manchuria in 1935, and 30,293 cases of syphilis and 27,631 cases of gonorrhea in 1937 About 30 per cent of the Mongolian people examined were infected with venereal diseases (Manshû Nenkan, 1943). The five plague prevention hospitals in north Manchuria recorded an average of 6.4 per cent syphilis admissions while in Neu-chuang, southern Manchuria, 13.5 per cent syphilis and 14.8 per cent gonorrhea infections were reported (Wu, 1927). Matsuda (1929) reported the results of serodiagnosis for syphilis of 1,460 women who were engaged in certain occupations in Ta-lien from 1926 to 1929. Seven hundred sixty three (763) of these were positive for the reaction, representing a rate of 52.26 per cent infection. Of 48,420 patients treated at the Manchuria Medical College from 1914 to 1933, 2,445 (5.05 per cent) were cases of chancre and lymphadenitis (Sakurai et al, 1934). Of 1,071 Chinese school children tested for congenital syphilis, 18 (1.68 per cent) gave positive Wasserman reaction (Yamagishi and Kano, 1938). Yamane (1938) examined 2,325 Manchurian prostitutes and reported 5.3 per cent positive for syphilis, 4.2 per cent positive for chancroid, and 7.2 per cent positive for gonorrhea.

CHAPTER XIII

SKIN DISEASES

Due to insanitary conditions, skin diseases are very prevalent throughout Manchuria. The Manchoukuo Yearbook (1941) reported that of 185,843 patients treated by "public physicians" in 1937 15,759 were cases of skin disease and adnexa. The "circulating clinic" sponsored by the Manchuria Medical College, which contacted people in areas where medical facilities are not available, reported the prevalence of skin diseases throughout the country. Niizawa (1936) showed that ten per cent of all patients at 26 localities along two railway lines in central Liaoning Province were infected with skin diseases. Murayama (1934) reported that of 5,322 patients treated during ten missions to western Manchuria and Inner Mongolia, 3,527 (66.3 per cent) were cases of skin diseases. However, statistical data concerning this group of diseases are scarce and no accurate statement can be made regarding their relative prevalence. The following paragraphs include only diseases of importance or those peculiar to Manchuria.

Dermatomycoses. Trichophytoses are common in Manchuria. Kitamura and Terai (1933) reported that 170 cases of trichophytosis were treated in the Department of Dermatology, Manchuria Medical College, from December 1931 to February 1933. One hundred fifty five (155) cultures were made of these cases of which 80 were positive. Among 3,500 Korean refugees in the Mukden region, 130 cases of trichophytosis were found from September to November 1932. In Harbin 170 cases of trichophytosis were detected among 4,102 Manchurian refugees from January 6 to January 9, 1933. Of 540 school children in Harbin, 50 were infected with trichophytosis. Of 187 cases of dermatomycosis treated in different localities of north Manchuria, 123 suffered from trichophytosis, 42 from zoster facialis and 22 from favus. Niizawa (1936) reported that 80 of 250 patients with skin diseases suffered from mycosis and 67 of them from trichophytosis. This author (1938) further reported 163 cases of dermatomycosis among the Japanese troops stationed in Liao-yang and Tieh-ling over a period of 25 months from April 1934 to May 1936, all of which were cases of trichophytosis. Terai (1934) again reported 147 cases of trichophytosis treated in the Laboratory of Dermatology of the Manchuria Medical College from February 1933 to March 1934. The total number of patients during this period was 3,374 and trichophytosis cases represented 4.35 per cent. Cultures were made of 107 cases with 60 of them positive. The author obtained 231 positive cultures including 143 from patients in the Manchuria Medical College, eight from Korean refugees in southern Liaoning Province, 21 from Manchurian refugees in Harbin and 59 from patients of several localities in northern Manchuria. The types of disease and the species of fungi for 231 cases are tabulated in Table 19.

TABLE 19

TRICHOPHYTOSES AND THEIR CAUSATIVE ORGANISMS IN MANCHURIA

	Microsporon japonicum	Bodinia violaceum	Bodinia glabrum	Sabouraudites ruber	S. interdigitalis	S. asteroides	Tr. pedis	Total
Trichophytosis superficialis capillitii	56	4						60
Kerion celsi						1		1
T. maculovesiculosa	2		1	17		2		22
T. eczematosa marginata				23	1			24
T. pompholyciformis				29	54		1	84
T. interdigitalis				17	6		1	24
T. onychomycosis				12	2			14
Eczema mycoticum	1	1	—	—	—	—	—	2
Total	59	5	1	98	63	3	2	231

The climate of Manchuria is favorable for the growth of Microsporon japonicum, Sabouraudites ruber and S. interdigitalis and these fungi are responsible for the majority of the trichophytosis cases.

Terai (1935) stated that tinea imbricata is very rare in Manchuria and only three cases had been reported up to that time. But Taylor (1935) listed 20 cases of the infection treated at the Mukden Hospital from 1929 to 1933, representing 16 per 100,000 admissions.

Hongkong foot, or tinea pedis, is very common in Manchuria. Taylor (1935) reported 387 cases at Mukden Hospital during a period of five years, representing 38 per 10,000 of the total patients.

Favus infection is also common in Manchuria. Terai (1934) showed that 22 out of 187 cases of skin diseases were infections of favus. Niizawa (1936) reported that twelve out of 58 mycosis cases were favus. The latter author identified the pathogen of these particular cases as Grubyella schönleinii var mongolica Ota and Hashimoto.

Pityriasis has also been reported from Manchuria. Yajima (1935) observed a case of pityriasis rubra pilaris treated at the Manchuria Medical College Hospital. The patient was a Japanese girl, 19 years of age. A Japanese male case of pityriasis circinata was reported from the same hospital by Mori in 1937. The author stated that one Chinese case and two Korean cases of the disease had been reported in the literature. Takahara (1938) studied 15 cases of pityriasis rotunda treated in the Dermatological Clinic, Dairen (Ta-lien) Hospital, during a period of 15 years, representing 0.05 to 0.2 per cent of the total admissions of the department. Twelve cases occurred from 1931 to 1937.

Endemic dermatitis. This disease occurs in the wet low land along the Liao and Sunghua Rivers and their tributaries. The prevalent season is from July to the end of August. It affects only the workers in the rice fields. Those portions of the body frequently submerged in water, especially the legs and hands, become reddish with an itching vesicular rash. Susceptibility to the disease differs with individuals, but initial symptoms usually appear from two to 20 days after the workers are exposed to water in the field. The etiology of the disease is still obscure, and such organisms as the fluke, hookworm and bacteria, and chemical substances in the water have been suspected. An aquatic mite belonging to the family Tyroglyphidae was believed by many authors to be the cause of the dermatitis (Kubo and Baba, 1938; Kubo, Baba and Gomi, 1938; Kubo, Hiyeda and Takemore, 1939; Yasui and Himura, 1939).

Leprosy. Lepers have been seen in various parts of Manchuria for many years. Yu and Taylor (1931) noted that about 0.1 to 0.29 per cent of the total patients treated in various skin clinics in Manchuria were infected with leprosy. Apparently none of these cases were indiginous to Manchuria. These authors maintained the opinion that the disease was due to recent but not to earlier migrations from inner China. Yü (1935) again reported 23 cases seen in the Mukden College Hospital since the 1931 report. Three of these cases were natives of Manchuria and had never been out of the country.

SPECIAL ENDEMIC DISEASES

Epidemic Hemorrhagic Fever. Epidemic hemorrhagic fever* was first encountered in the Japanese army during the invasion of Manchuria. It is probably an old disease in Manchuria but its menace has not been recognized until recent years by Japanese medical personnel. A special commission was appointed and control regulations were drawn up by Japanese army authority for the prevention of the disease. However, this disease is still not well known and medical literature is not available.

The disease is known to occur in northern Manchuria, east of Greater Hsing-an Mountain (Ta-hsing-an-ling) and north of Ch'ang-pai-shan. Information as to its incidence is meagre. A relative incidence of 30 per cent and a true incidence of one per cent were reported by a Japanese army hospital at Sun-wu in 1942. In Hu-lin on the eastern border of Kirin Province as many as 40 cases were seen during one month in a Japanese regiment. During an epidemic of the disease in Hei-ho, northern Manchuria, in 1941, ten per cent of the personnel in the Japanese army were affected.

The case fatality rate was variably reported from 13 to 36 per cent. Death rarely occurs suddenly within one or two days. Epidemics of the disease generally occur during the change of season, in early April and November in Hei-ho and the Amur region and in April and May in areas further south.

The etiology and transmission of the disease have not yet been determined. Some Japanese workers believe that it is a rickettsial disease and is spread by ticks (Dermacentor nuttalli) parasitic on rodents, and that man contracts the infection through handling hay and other material. Others believe that it is transmitted by fleas, lice or other blood-sucking insects, and still others consider it to be caused by a filtrable virus. Positive reaction of Weil-Felix test of the blood has been reported but no detail of this study was available. The incubation period of the disease is said to be from one to three weeks. The onset is sudden with chills, fever, headache, sore joints, nausea and vomiting. The temperature rises sharply and may reach 38° to 40° C. It is characterized by hemorrhagic areas on the skin and mucous membranes, more marked on the body than on the extremities. Such areas, sometimes in the form of petechial rash, begin to appear on the third to fifth day, starting on the neck, shoulder and axilla and then spreading to other parts of the body. At times, hemorrhages occur at the gum line, along with epistaxis and hemoptysis. The conjunctiva becomes congested. There is a tendency to constipation, but sometimes diarrhea occurs and stools may be bloody. If there are extensive hemorrhages in the internal organs such as the liver, kidney, heart and brain, death is inevitable. The chief symptoms of the disease may be summarized as follows:

Day of Illness	1	2	3	4	5	6	7	8	9	10	11	12	13
Flushing	+	+	++	++	++	++	+	+	+	+	-	-	-
Congestion of Conjunctiva	-	+	++	++	++	++	++	++	+	+	+	-	-
Reddening of Pharynx	-	+	++	+++	+++	++	++	+	+	-	-	-	
Hemorrhages, Skin and Mucous membranes	-	-	++	++	++	+	+	+	-	-	-	-	
Nausea	+	+	++	++	++	++	++	+	+	-	-	-	
Insomnia	++	++	++	++	++	++	++	+	-	-	-	-	
Albumin in Urine	-	-	-	+	++	(+++)	(+++)	(+++)	++	++	+	+	-
Fever	+++	+++	+++	+++	+++	+++	+++	++	-	-			

Note: The circles indicate clots of fibrin.

Preventive measures, which are reported to be practiced by the Japanese army in Manchuria, consist of removing and burning the vegetation in the barrack area, exterminating rodents, which are the primary hosts of the ticks, and segregating patients and disinfecting their clothes and rooms.

K'oshan Disease. The disease was named "K'oshan disease" or "K'oshan heart disease" since it was first reported from K'o-shan-hsien in Heilung-kiang Province. In the late fall of 1935, a number of cases of the disease were reported from this district and surrounding counties with a sudden onset and high fatality. At first it was suspected to be plague but later proved otherwise. Headache and dizziness was noted at the onset, then nausea, vomiting and acute weakening of the heart, and finally death within a few days. The heart muscles were principally involved. Autopsies demonstrated a substantial change in the heart with infiltration of the cells and also scar-formation

* The Japanese name of the disease is ryukosei-shukketsu-netsu. Other terms encountered were Songo fever, Ta-yin-shan disease, Korinnetsu, epidemic spotted fever, acute spotted fever, and eruptive typhus.

as in the chronic heart muscle disease. Kubo (1938) divided the disease into three types according to its symptoms: acute type, "consumption" type, and "no disease" type. It is the acute type of the disease which has attracted the attention of the local authorities. A total of 183 cases were reported during the months of November and December 1935. More cases were reported in later years. Up to the end of 1938 more than 450 cases had been reported, all among the the native population. The case fatality is nearly 100 per cent and death generally occurs within a few days after the onset. More than 80 per cent of the cases were women of middle age. This type occurs only in the winter season from October to March. The disease was principally reported from Heilungkiang Province but cases have also been reported from Jehol and eastern Liaoning Province (Hara, 1939).

Various theories have been advanced regarding the cause of the condition without conelusive result (Abe, 1937, Shoyama et al, 1939). It is believed by many workers that the disease is non-communicable and that chronic CO poisoning with an acute final stage is probably the cause of this disease (Kubo, 1938; Hara, 1939). This assumption is based on the following facts: (1) the anatomical findings of the disease were very similar to those resulting from CO poisoning, (2) the situation in the dwellings of the endemic area is apt to cause CO poisoning, and (3) the symptoms of the disease are similar to those demonstrated experimentally in animals by CO poisoning. However, others (Hiyeda, 1939) considered that SiO_2 had more to do with the disease. Two to five times the ordinary amount of SiO_2 was found in the lung, liver and heart of the persons who died from K'oshan disease.

Kashin-Beck's Disease. The disease is endemic in northern Korea and Transbaikal. In Manchuria it is widely distributed in the northern part and has been reported from Kirin and various parts of Heilungkiang Province. The disease occurs mostly in the mountainous areas, with children more susceptible than adults. The cause of the disease is not well known. A close relationship between the disease and food was observed, and a chronic excessive absorption of inorganic iron was assumed to be the cause. Vegetables and grains were investigated, and those from the endemic area were found to have a higher iron content (Tanabe et al, 1939).

CHAPTER XV

HELMINTHIASES

NEMATODES

Ascariasis. In Manchuria, as in other parts of China, infection with Ascaris lumbricoides is prevalent and widespread. The average infection rate is reported to be 74 per cent. It is generally more prevalent in southern than in northern cities. In Ta-lien, 1,919 Japanese were examined and 47.2 per cent were found to harbor Ascaris lumbricoides (Shimizu, et al, 1925). Okamoto (1930) examined the feces of 1,026 school children and found 400 (39 per cent) infected with the round worm. Saito (1935) reported an average infection rate of 69.6 per cent among 326 prisoners examined in the city. The infestation was reported as high as 90 per cent among the Chinese. Hiyeda (1934) expressed the opinion that more than 80 per cent of the residents in Ta-lien and its vicinity are infested with Ascaris. Kitabatake (1935) found that of 62 persons in a village near Chin-chou, 28 (45.1 per cent) were infested with the round worm, and out of 350 persons on a farm near Ying-kou 179 (51.1 per cent) were infested. In Lü-shun (Port Arthur) 87.3 per cent of 954 Chinese children examined were found to harbor the worm (Hiyeda, 1932). In Mukden, Shimizu et al (1925) examined the feces of 650 persons (including school children and factory workers), and found 429 (66 per cent) with ascaris infection. This, if corrected at the rate of six examinations, would be about 90 per cent. Ishikawa (1929) found 49 per cent of the Chinese in-patients examined three times in the Manchurian Medical Hospital to harbor the worms, the infestation rate being 54 per cent if corrected to six examinations. Sumi and Kawasaki (1932) obtained 82 per cent of ascaris infection among school children by six successive examinations of their feces. Hiyeda (1934) reported an infection rate of 62 per cent. In Fu-shun, a mining center near Mukden, a survey was made by Ryo (1936) of 10,293 persons of various groups and an average infestation rate of 84.6 per cent was obtained. In the northern parts of Manchuria, ascaris infestation was much lighter. Lin and Wu (1927) found that only 111 (19.47 per cent) of 570 persons examined were infested with the nematode. The ascaris infection among the Mongolian people seems fairly heavy. Ishikawa (1929) reported the examination of 234 natives of Eastern Mongolia with 60.3 per cent positive for the infection.

Ankylostomiasis. Hookworm infection is found in most parts of Manchuria but its distribution varies with latitude. Like ascariasis, the infestation is generally heavier in the south than in the north. The following infestation rates have been reported in various localities: 10.7 to 38 per cent in Ta-lien (Saito, 1935; Hiyeda, 1932; Morikawa and Fukuda, (1937); 19.6 per cent in Port Arthur (Hiyeda, 1932); six per cent in Ying-kou (Kitabatake, 1935); 6.3 per cent in Mukden (Hiyeda, 1934); 42.7 per cent in Fu-shun (Ryo, 1936); three per cent in Ch'ang-ch'un (Hiyeda, 1934); 3.3 per cent in Harbin (Lin and Wu, 1927). It should be noted that the infestation of hookworm is particularly heavy among the inhabitants of Fu-shun. Ryo (1936) expressed the opinion that the main route of infection of this worm in Fu-shun seems to be cutaneous, while Hiyeda (1934) believed that most of the hookworm infection in Manchuria takes place orally since the people are seldom barefooted. According to Ryo, Necator americanus is rare in Fu-shun and the rate of infection compared with that of Ankylostoma duodenale is approximately seven to 40. Hiyeda (1934), however, claimed that the incidence of the two species is about the same.

Trichuriasis. Whipworm infection is common and widespread in Manchuria. The infestation rate seems also to be heavier in the south than in the north. In Ta-lien, the rate of infection was reported as high as 80 per cent (Hiyeda, 1934), with an average of 25-50 per cent (Saito, 1935; Morikawa et al, 1937); in Lu-shun 66.5 per cent (Hiyeda, 1932); in Mukden ten to 35 per cent (Shimizu et al, 1925; Ishikawa, 1929); in Harbin about five per cent (Lin and Wu, 1927).

Trichinosis. Human cases of trichinosis have not been reported from Manchuria. But the parasite, Trichinella spiralis, has been found in five out of 19 dogs in Liao-yang, and in five out of 150 dogs in Mukden (Yugawa, 1934; Yamane, 1938). Ch'in (1937) reported an infestation of a cat at Mukden, and Yugawa (1934) reported its occurrence in swine in Harbin and vicinity.

Other nematodiases. Other nematodes which have infected man in Manchuria are Enterobius vermicularis which is widespread and affects a great number of Chinese children, and Trichostrongylus orientalis of which an infestation rate of three per cent was found among the Japanese in Mukden and a rate of 0.8 per cent as reported from Harbin (Lin and Wu, 1927).

TREMATODES

Infestation by this group of helminths in Manchuria is light as compared with other parts of China, and fewer species are involved. Human infection has been reported with the following species: Clonorchis sinensis, Metagonimus yokogawai, Paragonimus westermani. The liver fluke, Clonorchis sinensis, is widespread. Human cases have been reported from Ta-lien (Morikawa et al, 1937; Saito, 1935), Mukden (Ishikawa, 1929), Liao-yang (Okabe, 1939) and Harbin (Lin and Wu, 1927). It is interesting to note that in Ta-lien, more than 20 cases were reported among the "foreigners" (probably mostly Russians) each year from 1930 to 1933 against only one Chinese case each in 1930 and 1931 and one Japanese case in 1931 (Morikawa et al, 1937). The parasite was also found in five of 60 dogs examined in Mukden (Yamane, 1938). Miyanaga (1939) examined 15 species of fresh-water fish in the Mukden area and found six of them to be infected with cysts of C. sinensis. The species of fish infected were Carassius vulgaris, Hemiculter cleupoides, Pseudogobio rivularis, Leucogobio herzensteini, Pseudorasbora parva, and Rhodeus notatus, the last three species being especially heavily infected with 125 to 188 cysts per 100 gram of meat. Asoda reported that Ophicephalus argus collected in the Sungari River near Harbin was infected with Clonorchis cysts (Okabe, 1939). The intestinal fluke, Metagonimus yokogawai, is fairly common, especially among the Japanese population. Fukuda and Morikawa (1936) reported 38 cases of the infection out of 5,077 patients examined in Ta-lien in 1935-1936, all but one of which were Japanese. The authors assumed the cases were not indiginous since the snail hosts of the trematode have not been found in Manchuria. In Fu-shun, 108 cases were reported in 1936 (Okabe,

1939). Cases have also been reported from Mukden (Ishikawa, 1929) and Harbin (Lin and Wu, 1927). Okabe (1939) reported that the fish, Culter erythrogterus Basilewsky, Siniperca chuatsi (Basil), Parabramis pekinensis (Basil), Pseudorasbora parva (T. et S), Ophicephalus argus Cantor and Hemibarbus maculatus Bleeker, collected from Ha-ta-ho, Chia-mu-ssu, Yung-feng-chen and Harbin were infected with the cysts of M. yokogawai. Eggs of the parasite have been found on pickled vegetables sold in Ta-lien (Morikawa et al, 1937; Fukuda and Aki, 1937). Infections with the lung fluke, Paragonimus westermani, were reported from Ta-lien, Mukden and Harbin. In Ta-lien, the Kwantung Government reported three cases each in 1930 and 1931, and 125 cases in 1932. Of these, 124 cases were Japanese (Morikawa et al, 1937). Leo (1938) observed three cases at the Mukden Medical College Hospital and claimed that one case seemed to have contracted the infection in Mukden and the other two in south China. Lin and Wu (1927) reported a single case of 350 persons examined in Harbin. Abe and Asada (1938) collected the snail host of P. westermani from Kirin and southern Liaoning province. The snail was identified as Cambaroides dauricus. The crab host, Eriocheir japonicus and probably also E. sinensis were reported from Manchuria (Kobayashi, 1934). The Oriental blood fluke, Schistosoma japonicum and the giant intestinal fluke, Fasciolopsis buski, both of which are prevalent in central and south China, have not been reported from Manchuria, except three cases of the former among 305 Japanese in Manchuria. However, these cases were not considered as being contracted locally (Matsuo, 1935).

CESTODES

Tapeworm infections are not uncommon in Manchuria, especially among the Mongolian natives living in the northern part of the country. According to a Kwantung Government report there were 399 cases of taeniasis in Ta-lien from 1930 to 1932. Most of the cases were Japanese (Morikawa et al, 1937). Both Taenia solium and T. saginata have been reported from Ta-lien (Okamoto, 1930; Morikawa et al, 1937) and Mukden (Shimizu et al, 1925; Ishikawa, 1929). The beef tapeworm seems to be more common than the pork tape worm, although definite information is not available. Cysticercus cellulosae hominis is often found in Manchuria. Four cases were observed in Mukden; two were Chinese (Kato, 1932) one a Korean (Terai, 1933) and one a Japanese (Matsuura, 1935). On a farm near Ying-kou, out of 350 persons examined 23 were found to harbor tapeworms, including 16 cases of Hymenolepis nana (Kitabatake, 1935). A few cases of this dwarf tapeworm have also been reported from Ta-lien (Morikawa et al, 1937) and Mukden (Ishikawa, 1929). Lin and Wu (1927) reported three cases of infestation with Bothriocephalus latus of 220 persons examined at Harbin. One case of Dipylidium caninum was found among 650 persons examined at Mukden (Shimizu et al, 1925).

CHAPTER XVI

INTESTINAL PROTOZOA

Endamoeba histolytica is the most notable intestinal protozoa in Manchuria. A great number of apparently healthy persons were observed to be cyst-carriers of the parasite. An average of 21 per cent of the population were cyst-carriers, and in the heavily infected area of Mukden as much as 38.6 per cent (Hiyeda, 1934). About 24 per cent of Chinese prisoners and 21 per cent of the Korean prisoners at Ta-lien were infected with the parasite (Saito, 1935). Endamoeba nana is the most common intestinal protozoa in Manchuria. The average infection rate is reported to be 41 per cent, with the highest rate of 58 per cent at Mukden and the lowest of 26 per cent at Antung. The average infection rate of E. coli was reported to be 23 per cent and that of Iodamoeba bütschlii nine per cent (Hiyeda, 1934). An infection rate of 5.4 per cent with Giardia lamblia was reported among the railway workers along the South Manchuria Railway, and a rate of 25 per cent among the school children in Mukden (Hiyeda and Suzuki, 1933). Kitabatake (1935) showed that eight of 25 Japanese child emigrants at Ai-chuan village, Chin-chou, were infected with the parasite. Parasitism with this protozoa frequently causes temporary diarrhea in children but seldom in adults. Tsuda (1936) reported an infection rate of 44.0 per cent with Enteromonas hominis (= Trichomonas intestinalis) in the vicinity of Ch'eng-te, Jehol Province. Hiyeda (1934) reported the infection rate with this parasite in south Manchuria to be 2.6 (at An-shan) to 11.3 per cent (at Ta-lien), averaging 8.4 per cent. Infection with Chilomastix mesnili in Manchuria was reported to range from 1.7 to 6.6 per cent with an average of 4.4 per cent (Hiyeda, 1934).

CHAPTER XVII

ANIMALS OF MEDICAL IMPORTANCE

Culicidae (Mosquitoes). The mosquito fauna of Manchuria is more or less similar to that of north China although the number of recorded species is considerably smaller. This is probably due to the fact that much less collecting has been done in this territory. The available information shows that only two species of Anopheles, six species of Aëdes and seven species of Culex have been recorded from Manchuria. The following information is based largely on Feng (1938) with some additions from subsequent publications.

Anopheles hyrcanus sinensis Wiedemann, 1828. This is the most common anopheline mosquito in China. In Manchuria it is also widespread and has been collected from Hai-lung and Mukden of Liaoning Province, Ch'ang-ch'un and Yung-chi of Kirin Province and in the lower Sungari region between Lahasusu and Gadikaudza (K'o-shan, Pei-an and Teh-tu) of Heilungkiang Province. The larvae of this mosquito breed in almost any collection of ground water and occasionally even in artificial water. Adult females enter houses and attack man as well as domestic animals. There is a diversity of opinion regarding the feeding habits of this mosquito. In some areas it appears to be strongly zoophilic, rarely attacking man while in other areas relatively large percentages of the engorged females are found to contain human blood. This species plays only a minor role in the transmission of malaria in other parts of China. However, in southern Manchuria where no other anopheline is found this is the only species responsible for malaria transmission. This species is also a vector of filariasis in China.

Anopheles (Anopheles) labranchiae atroparvus van Thiel, 1927. This mosquito has been reported by Feng and Ch'in (1937) from Hei-ho and Lungchen in the northern Heilungkiang Province. The authors stated that "the structure of the male terminalia suggests that it probably belongs to A. maculipennis var. atroparvus. Since this variety is one of the principal malaria carriers in Europe, its presence in north Manchuria may explain the high incidence of malaria in certain localities of that region". In 1938, Ch'in collected three more specimens, two from Pei-an and one from Teh-tu, together with many specimens of A. hyrcanus sinensis in the same area. One should bear in mind that A. messeae has been reported by Russian workers to occur along the Amur River country and that Anopheles lewisi Ludlow and A. selengensis Ludlow were originally described from Siberia. Recently Aitken (1934) noted that A. maculipennis selengensis should remain a synonym of A. maculipennis lewisi, and suggested that Falleroni's messeae from Italy is in reality Ludlow's lewisi. It is possible that the Siberian messeae may be proved to be identical with lewisi. Feng stated that the larvae of atroparvus are found in ditches containing fresh water. Adults have been collected within houses.

Aëdes (Ochlerotatus) dorsalis (Meigen) 1832. This holarctic mosquito has been collected from Mukden of Liaoning Province. Its larvae are found in natural pools and in marshes. The female adult is anthropophilic and diurnal in habits. There is no definite evidence concerning the role of this mosquito as a vector of disease.

Aëdes (Ochlerotatus) maculatus (Meigen), 1804. This species is palearctic in its distribution and has been collected from Ch'ang-ch'un of Kirin Province and Mukden of Liaoning Province. Its breeding habits are similar to those of the preceding species.

Aëdes (Aedimorphus) vexans (Meigen), 1830. This mosquito has a wide distribution in other parts of China but has been recorded only from Hailung, Liaoning Province, in Manchuria. Larvae are found in natural pools and swamps. The females have been observed to bite man both during the day and at night.

Aëdes (Finlaya) koreicus Edwards, 1917. This Korean species has been found in Hopei and Shantung. In Manchuria it was collected only from Mukden. The larvae of this species breed in household containers such as flower pots, barrels, etc. as well as in water pools in rocks and in hills. The adults are anthrophilic and bite both day and night. This species was demonstrated experimentally to transmit Dirofilaria immitis of dogs at Peiping.

Aëdes (Finlaya) seoulensis Yamada 1921. This species has been collected from Mukden. The larvae breed in tree holes. Adults have been reported to bite during the day.

Aëdes (Stegomyia) chemulpoensis Yamada, 1921. This species has been recorded from Mukden. It is also a tree hole breeder. The females vigorously attack man during the day. Wuchereria bancrofti were found partly developed in this species.

Culex (Barraudius) modestus Ficalbi, 1890. This is a rare species in Manchuria and has been collected at Mukden and Hai-lung. The larvae breed in ponds. Nothing is known regarding the habits of the adults.

Culex (Neoculex) hayashi Yamada, 1917. This is also an uncommon species in Manchuria, and was collected only in Mukden. The larvae seem to prefer pools and slowly flowing streams. Nothing is known concerning the adult habits.

Culex (Culex) bitaeniorhynchus Giles, 1901. This species is widespread in China and has been reported from Mukden of Liaoning Province. The larvae breed in fresh and clean natural water with filamentous green algae. The adult females generally attack man at night but sometimes also during the day. Infective larvae of Wuchereria bancrofti have been obtained experimentally from one specimen (Hu, 1939) but it is not considered as a suitable host of the parasite.

Culex (Culex) orientalis Edwards, 1921. The larvae of this species were collected from a lake near Mukden with much surface vegetation. Nothing is known concerning the habits of the adults.

Culex (Culex) pipiens pallens Coquillett, 1898. This is a common northern species in China and has been reported from Yung-chi and Ch'ang-ch'un in Kirin Province, and Mukden and Hai-lung of Liaoning Province. The larvae breed almost in any collection of water but especially in those containing much organic matter. Adult females are strongly anthropophilic and attack at night. They are frequently found inside human dwellings. It is a suitable intermediate host of Wuchereria bancrofti in central China and Japan.

Culex (Culex) tritaeniorhynchus Giles, 1901. This is a widespread mosquito in China. In Manchuria it has been collected from Yung-chi and Ch'ang-ch'un of Kirin Province and Hai-lung of Liaoning Province. The larvae breed in ponds, pools, ditches, rice fields, etc. The adults bite man frequently during the night inside houses as well as in the open. This species is a possible vector of filariasis.

Culex (Culex) vagans Wiedemann, 1828. This species is widespread in China. In Manchuria it has been reported from Yung-chi of Kirin Province, and Mukden of Liaoning Province. The larvae breed in lakes and pools, and also in water pools in hilly streams containing filamentous algae. No information has been recorded concerning the habits of the adults.

Psychodidae (Sand Flies). The genus Phlebotomus of this family includes vectors of kala azar which disease is endemic in southern Manchuria. No investigation has been made regarding the Phlebotomus fauna of Manchuria. Yang (1935) reported that these insects are uncommon in Cheng-te, Jehol Province and rare in Mukden, without specifying the species. Phlebotomus chinensis and P. sergenti mongolensis which are common in north China may also occur in Manchuria.

Heleidae (Biting Midges). These are very small blood sucking gnats. With the exception of a few species of Culicoides which have been reported to transmit filaria non-pathogenic to man, these flies are of medical importance because of their extremely annoying bites. A number of species belonging to various genera have been reported in Manchuria. Eight species of Culicoides are represented in this region. These are:

Culicoides albicans (Winnertz). This species is not blood sucking as far as known.
Localities: Shih-men-tzu, Huang-tao-ho-tzu (Takahasi, 1941).

Culicoides buhetoensis Takahasi. This is a biting species and is recorded only in Po-k'o-t'u (Buheto) (Takahasi, 1941).

Culicoides chiopterus (Meigen). There is no record of blood sucking habits for this species. It was collected in Huang-tao-ho-tzu (Takahasi, 1941).

Culicoides erairai Kono and Takahasi. This is a troublesome and abundant species in northeastern Manchuria. It principally attacks the hairy parts of the body, and its bite causes large painful swelling. It is most active in the evening or in cloudy weather and has been collected in Shih-men-tzu, Tung-ning, Mu-tan-chiang and Ma-shan (Takahasi, 1941).

Culicoides nubeculosus Meigen. This species attacks man during the day. It has been collected from Yen-chi, Hsi-la-mu-lun River and Hsing-ho, Manchuria, and also from Chang-pei, Inner Mongolia (Tokunaga, 1940).

Culicoides obsoletus (Meigen). This is a very troublesome small species and its bite is always painful. It has been collected in Huang-tao-ho-tzu, and Mu-tan-chiang (Takahasi, 1941).

Culicoides onoi Tokunaga. This species has been collected only from Ch'ang-ch'un, Kirin (Tokunaga, 1940). There is no record of its feeding habits.

Culicoides pulicaris ocellaris Kieffer. This variety is very troublesome on calm days, and attacks man severely. It has been collected from Chang-pei, Inner Mongolia (Takunaga, 1940).

Culicoides pulicaris punctatus (Meigen). This variety is also very troublesome and is most active out of doors in the evening. It has been collected from Shih-men-tzu, Huang-tao-ho-tzu and Tung-ning (Takahasi, 1941).

Key to Species of Culicoides in Manchuria

1. Wings uniformly colored or with a single dark spot on costal margin..... 2

   Wings with light spots on a dark ground or dark spots on a light ground..... 3

2. Wings with macrotrichia nearly all over.C. albicans

   Wings nearly bare.....C. chiopterus

3. Wings with second radial cell entirely dark.... 5

   Wings with second radial cell partly pale..... 4

4. Wings bare except at the tip, markings very faint..... C. obsoletus

   Wings clothed with macrotrichia on the greater part of surface, markings more definite... C. pulicaris

5. Wings without dark spot on basal half of costal margin, legs pale brown..... C. buhetoensis

   Wings with dark spot on basal half of costal margin, legs dark or with dark markings..... 6

6 Thorax with numerous dark dots at base of setae ..... C. nubeculosus

   Thorax otherwise marked..... 7

7. Wings dark, with three pale spots beyond the second radial cell..... C. erairai

   Wings grayish, with only one definite pale spot beyond the second radial cell..... C. onoi

In 1941, Tokunaga added five more species of Heleidae to the Manchurian fauna, viz., Atrichopogon (Kempia) dorsalis Tokunaga, Dasyhelea sp., Spaeromias pictus Meigen, Palpomyia nubeculosa Tokunaga and Dicrobezzia venusta Meigen; all being collected from Harbin. In addition the author listed a number of other species with the locality data as "Yablonia, Manchuria" which cannot be located and hence are omitted here.

Simuliidae (Black Flies). Only one genus, Simulium, of this family has been reported to transmit disease. Certain species of the genus are intermediate hosts for the filarial worm causing onchocerciosis in Africa and Central America. S. decorum was incriminated for the mechanical transmission of tularemia! The black flies are vicious and persistent biters. They attack both man and domestic as well as wild animals during the day. Takahasi (1940) reported the following species of Simuliidae from Manchuria:

Simulium (Hellichia) kariyai Takahasi
Locality: Kung-chu-ling

Simulium (Astega) lanata Takahasi
Locality: A-erh-shan

Simulium (Nevermania) koidzumii Takahasi
Localities: Hailar, Sun-wu, Hei-ho, Nan-tun, Nai-lo-mu-t'u, Shang-ku-li, Man-chou-li, A-erh-shan.

Simulium (Odagmia) halonensis Takahasi
Locality: A-erh-shan

Simulium (Simulium) ishikawai Takahasi
Locality: A-erh-shan

Simulium (Simulium) reptans (Linnaeus)
Locality: Huang-tao-ho-tzu

The following key to the species is taken from Takahasi:

Key to Species of Manchurian Simuliidae

1. Hind leg without calcipala and pedisulcus..... 2

   Hind leg with distinct calcipala and pedisulcus. 3

2. Claws simple..... Hellichia kariyai

   Claws bifid (i.e. with basal tooth). Astega lanata

3. Fore tarsi cylindrical, brown; fore tibiae without white patch..... Nevermania koidzumii

   Fore tarsi flattened, black; fore tibiae with white patch..... 4

4. Claws simple..... 5

   Claws bifid..... Odagmia halonensis

5. All femora clear yellow..... Simulium ishikawai

   Femora browhish..... Simulium reptans

Muscoid Flies. With the exception of the genus Glossina which is known to be a true vector of African sleeping sickness, the members of this large group are not vectors in an epidemiological sense. However, many species of these flies are important as mechanical carriers of such diseases as dysentery, typhoid fever, cholera, etc. and in many species the larvae may be tissue parasites of man, producing myiasis. Only one blood-sucking species, Haematobia perturbans Bezzi, was reported from Ch'eng-te, Jehol Province (Kato, 1936). Although records of other blood-sucking species in Manchuria are lacking, their presence should be suspected. A number of non-blood-sucking species of muscoid flies were reported from Manchuria and of these the following are of medical importance.

The flesh flies (Sarcophagidae) usually have strikingly large bodies with greyish abdomen. Wohlfahrtia magnifica (Schiner) was found in Manchuria. This species has been reported to commonly infest man in Europe and especially in Russia. The fly deposits its living larvae not only in wounds but also in nasal fossae, the eyes and the ears. Four species of the genus Sarcophaga are found in Manchuria. These are S. crassipalpis Macquart, S. striata (Fabricius), S. peregrina Robineau-Desvordy and S. carnaria (Linnaeus). The larvae of these flies usually feed upon meats but have also been found in other food stuff and waste. Many cases have been recorded of their occurrence as accidental parasites of the human intestine.

The blue bottle flies (Calliphoridae) can be easily recognized by their robust size and the metallic color of their bodies. They are generally scavengers, feeding on fish, decaying meat and human and animal excrement. They are also ovoviviparous and occasionally deposit their living young in wounds. The following species have been reported from Manchuria: Lucilia caesar (Linnaeus), Lucilia illustris (Meigen), Lucilia sericata (Meigen) and Calliphora erythrocephalus (Meigen). Chrysomyia megacephala Fabricious and Lucilia cuprina Wiedemann have been collected from Jehol (Takano, 1936).

The larvae of the heel flies (Hypodermatidae) are normally parasitic in cattle but occasionally also in man. The two well-known species, Hypoderma lineata (de Villers) and Hypoderma bovis (DeGeer) are both found in Manchuria.

Of the family Oestridae (sheep bot), only one species, Rhinoestrus purpureus (Brauer), is found in Manchuria. This species usually attacks horses but may also attack man either in the nose or eye.

The family Muscidae (house flies and their allies) includes many house invading flies. Because of their habit of feeding on and alighting on human food, these flies are important mechanical transmitters of many diseases. The common house flies, Musca, and the lesser house flies, Fannia, have the additional habit of regurgitating ingested food on substance upon which they are resting and readily contaminating food. The following species are represented in this region: Musca domestica (Linnaeus), Muscina stabulans (Fallen), Fannia canicularis (Linnaeus) and Fannia scalaris (Fabricius).

Tabanidae (Horseflies). The family Tabanidae (horseflies) includes large and sturdy flies which are well known pests of cattle, horses, and other animals, and are often extremely annoying to man. Some species of horseflies have been reported to play important roles as carriers of certain diseases such as anthrax, trypanosomiasis, and tularaemia. This important group of insects is little known in Manchuria. The following species have been recorded from Manchuria (Olsoufiev, 1937 and Wu, 1940): Chrysops suavis Ludlow, Chrysops valida Ludlow, Tabanus tarandinoides Olsoufiev, Tabanus brevis Ludlow, Tabanus pleskei Kröber, Tabanus geminus Szilady, Chrysozona tamerlani Szilady, and Chrysozona yamadai (Shiraki). Since many species of this family are known from Siberia, Mongolia and Korea, this family is probably much better represented in Manchuria than is indicated by this record.

Anopleura (Lice). The role of the body louse, Pediculus humanus corporis, in the transmission of typhus fever and relapsing fever is discussed in previous chapters. This species is wide-spread in Manchuria. It may be assumed that the distribution of the head louse, P. humanus capitus and the crab louse, Phthirius pubis, are wide-spread in Manchuria although definite information is lacking. Ono (1939) reported that Polyplax spinulosa (Burmeister) was collected from Rattus norvegicus at Ch'ang-ch'un and Nung-an, Kirin, and considered it a vector of typhus fever among rats.

Siphonaptera (Fleas). In addition to annoyance caused by their biting, fleas are of considerable medical importance in the transmission of plague and murine typhus. The species involved in this transmission are the rat fleas Xenopsylla cheopis and Ceratophyllus anisus which are wide-spread in Manchuria. The Manchurian Siphonaptera are listed as follows (Liu, 1939 and subsequent publications):

Amphalius runatus (Jordan and Rothschild), 1923.
Ceratophyllus runatus Jordan and Rothschild, 1923.
Host: Ochotona dahurica, Ochotona alpina.
Records: Manchuria, Mongolia (Urga), Transbaikalia.

Oropsylla silantiewi silantiewi (Wagner), 1898.
Ceratophyllus silantiewi Wagner, 1898.
Host: Marmota bobac.
Records: Manchuria.

Oropsylla elana Jordan, 1929.
Host: Citellus mongolicus (?), Cricetulus campbelli.
Records: Manchuria (Bank of Sungari River opposite Harbin and Anda Steppe near Harbin).

Ceratophyllus (Citellophilus) tesquorum sungaris Jordan, 1929
Citellophilus tesquorum sungaris Jordan, 1929
Host: Cricetulus arenarius, Citellus mongolicus (?)
Records: Manchuria (Ta-lin, Chien-chia-tien, T'ungliao, and Sungari River opposite Harbin).

Ceratophyllus (Monopsyllus) anisus Rothschild, 1908.
Monopsylla anisus (Rothschild), 1908
Host: Rattus spp.
Records: Manchuria (near Ta-lien).

Ophthalmopsylla kukuschikini Ioff, 1927.
Host: Cricetulus griseus fumatus.
Records: South Manchuria (sand dunes near Chien-chia-tien). Transbaikalia on Citellus dahuricus.

Ophthalmopsylla jettmari Jordan, 1929.
Host: Cricetulus spp.
Records: South Manchuria (sand dunes near Chien-chia-tien).

Frontopsylla elatus botis Jordan, 1929.
Host: Rats.
Records: South Manchuria (Charithun near Nungkiang).

Frontopsylla luculenta luculenta (Jordan and Rothschild), 1923.
Ceratophyllus luculentus Jordan and Rothschild, 1923.
Host: Ochotona dahurica.
Records: Manchuria, Transbaikalia.

Amphipsylla aspalacis Jordan, 1929.
Host: Myotalpa aspalax (?)
Records: Manchuria (Sansin, Lahasusu).

Amphipsylla vinogradovi Ioff, 1927.
Host: Cricetulus furunculus.
Records: Manchuria (Sansin), Transbaikalia.

Neopsylla bidentatiformis (Wagner), 1933.
Typhlopsylla bidentatiformis Wagner, 1933.
Host: Many species of wild rodents.
Records: Manchuria.

Pectinoctenus adalis Jordan, 1929.
Host: Rat.
Records: Manchuria (Charithun near Nunkiang).

Rectofrontia dahurica (Jordan and Rothschild), 1923.
Rhadinopsylla dahurica Jordan and Rothschild, 1923.
Host: Ochotona dahurica.
Records: Manchuria, Transbaikalia.

Rectofrontia tenella (Jordan), 1929.
Rhadinopsylla tenella Jordan, 1929.
Host: Cricetulus sp.
Records: Manchuria. (Chien-chia-tien).

Rectofrontia dives (Jordan), 1929.
Rhadinopsylla dives Jordan, 1929.
Host: Cricetulus griseus, Citellus sp.
Records: South Manchuria (Near Chien-chia-tien and Ta-lin).

Rectofrontia jaonis (Jordan), 1929.
Rhadinopsylla jaonis Jordan, 1929.
Host: Scaptochirus gilliesi, Myotalpa aspalax.
Records: Manchuria (Sansin).

Rectofrontia insolita (Jordan), 1929.
Rhadinopsylla insolita Jordan, 1929.
Host: Cricetulus sp.
Records: South Manchuria (near Chien-chia-tien and Ta-lin).

Myodopsylla trisellis Jordan, 1929.
Host: Pipistrellus.
Records: Manchuria (Charithun near Nunkiang).

Xenopsylla cheopis (Rothschild), 1903.
Pulex cheopis Rothschild, 1903.
Loemopsylla cheopis Rothschild, 1903.
Host: Various species of Rattus, occasionally man.
Records: Manchuria (near Ta-lien).

Pulex irritans Linnaeus, 1758.
Host: Man, domestic mammals, other mammals.
Records: Manchuria; Ch'ao-yang (Jehol).

Pulex orientalis Kishida, 1939.
Host: Dog.
Records: Jehol.

Cimicidae (Bed Bugs). Bed bugs are common in Manchuria, especially in public places such as hotels and dormitories. The species involved is Cimex lectularius. There is no definite evidence that the bed bugs are vectors of diseases although they may serve as mechanical carriers.

Ixodoidea (Ticks). At present there is no information concerning the medical importance of ticks in Manchuria. However, Ixodes persulcatus has been demonstrated by Russian authors (Solov'yev, 1941; Chagin & Kondratiev, 1943) as the vector of the tick-borne encephalitis which occurs throughout the wooded areas of the Khabarovsk and Maritime Krais of the USSR. This species has been reported from the Amur River region and Japan. It is possible that the tick as well as the disease also occur in Manchuria. Some Japanese authors suspected Dermacentor sp. as the vector of haemorrhagic fever which is reported to be endemic in northern Manchuria. Ticks also serve as vector of relapsing fever, tick-borne typhus, tularemia, etc. The tick-fauna of Manchuria is poorly known; only two species, Hyalomma detritum albipictum Schulze, and Dermacentor reticulatus (Fabricius) have Manchurian record and four species, Argas persicus Oken, Haemaphysalis neumanni Doenitz, Discolophus tokunagai Kishida and Ixodes angulatus Kishida are reported from Jehol (Kishida, 1939). Due to their cosmopolitan distribution and their occurrence in the neighboring areas the following species will be eventually found in Manchuria: Ixodes persulcatus Schulze, 1930; Ixodes autumnalis Leach, 1815; Ixodes ricinus (Linnaeus, 1758); Rhipicephalus sanguineus Latreille, 1806; Hyalomma aegyptium (Linnaeus, 1758); Haemaphysalis bispinosa Neumann, 1897; Haemaphysalis campanulata Warburton, 1908; Haemaphysalis japonica douglasi Nuttall & Warburton, 1915; Dermacentor nuttalli Olenev, 1929; Argas persicus Oken, 1818.

Mollusca and Crustacea of Medical Importance. Various species of snails are important as obligatory intermediate hosts of trematodes. Few available reports on the species of snails serving as intermediate hosts of the human parasitic flukes in Manchuria are available, although human infection with such flukes as Clonorchis sinensis, Metagonimus yokogawai, and Paragonimus westermani has been reported in this territory. A snail host of P. westermani, identified as Cambaroides dauricus was collected in Kirin and southern Liaoning Province (Abe and Asada, 1938). Ono (1935) reported that snails of the genus Lymnaea are common in the vicinity of Mukden. About one per cent of a small-sized Lymnaea (L. pervia ?) was found to be infected with Fasciola hepatica. Fork-tailed cercariae, echinosdome cercariae and stylet-cercariae were observed in a large-sized Lymnaea, resembling L. japonica. The presence of snails of the genus Melania and Bithynia should

also be suspected. Kobayashi (1934) reported that the crab, Eriocheir japonicus and probably also E. sinensis, both serving as second host of P. westermani were present in Manchuria.

Fish of Medical Importance. Certain species of fresh-water fish, primarily of the families Cyprinidae, Gobidae, Anabantidae and Salmonidae, serve as the secondary intermediate hosts of parasitic flukes. Miyanaga (1939) examined 15 species of fresh-water fish in the Mukden area and found six of them to be infected with cysts of Clonorchis sinensis. These were Carassius vulgaris, Hemiculter cleupoides, Pseudogobio rivularis, Leucogobio herzensteini, Pseudorasbora parva, and Rhodeus notatus. Asada reported that Ophicephalus argus collected in Harbin was found to be infected with Clonorchis cysts (Okabe, 1939). Okabe (1939) found the cysts of Metagonimus yokogawai in Culter erythropterus Basilewsky (?) from Mi-shan-hsien, in Sinipeca chuatsi (Basil.), Parabramis pekinensis (Basil.) and Ophicephalus argus Cantor from Chia-mu-ssu, in Pseudorasbora parva (T. & S.) from Hua-chuan-hsien and in Hemibarbus maculatus Bleeker from Harbin. There is no authentic report on the poisonous and venomous fish in Manchuria, although they may be present.

Poisonous Snakes. Poisonous snakes, which are a hazard in tropical and subtropical regions, are of little medical importance in Manchuria. Only one species, Agkistrodon halys (Pallas) (= A. blomhoffii Boie), has been reported from this territory. This is a rather short and thick species less than two feet long and is light gray with a series of large more or less alternating darker gray blotches extending along either side of the dorsum. These blotches are irregularly margined with black. The belly is gray and very densely mottled with blackish gray. The head is light gray above and darker on the side with a conspicuous narrow, light stripe. Its venom is hemotoxic. This snake is widely distributed in Manchuria. It has been collected from Harbin (Mori, 1937), An-tung (Mori, 1937) and Hsiao-lung-shan-tao, a small island beyond the tip of the Liaotung Peninsula (Koba, 1938). Okada (1935) reported it from Wu-ling-shan which is located in northern Hopei Province. Some authors divided this species into several subspecies. Of these A. halys brevicaudus Stejneger and A. halys intermedius bear Manchurian record (Mori, 1937).

Mammals of Medical Importance. Rats are of considerable importance as reservoirs of plague in Manchuria. Several species of the genus Rattus occur in this region. Among them are R. rattus rattus, R. rattus alexandrinus, R. humiliatus sowerbyi Howell and R. norvegicus caraco (Pallas), the last one being by far the most common species. Mus musculus and its varieties manchu and mongolium Thomas are also found. The Siberian marmots (tarabagans) Marmota bobak Müller serve as the principal reservoir of plague in the northern area. Two species of susliks, Citellus dauricus mongolicus and Citellus pygmaeus musicus were found to be infected with plague in Manchuria. Kuroda (1939) reported Citellus dauricus dauricus (Brandt), Citellus dauricus yamashinai Kuroda and Citellus eversmanni jacutensis (Brandt) from this region. Other rodents which have been reported from Manchuria are (Kuroda, 1939): Sciurus vulgaris mantchuricus Thomas, S. vulgaris chiliensis Sowerby, Scirustamias davidianus davidianus (Milne-Edwards), Eutamias sibericus uthensis (Pallas), E. sibericus senescens Miller, Tamiops swinhoei vestitus Miller, Microtus fortis pelliceus Thomas, Microtus mandarinus faeceus Allen, M. brandtii (Raddi), Eothenomys inez jeholicus Kuroda, Clethrionomys rutilus (Pallas), C. rufocanus arsenjevi (Dukelski), C. rufocanus regulus (Thomas), Cricetulus longicaudatus nigrescens Allen, C. barabensis griseus (Milne- Edwards), C. barabensis obscurus (Milne-Edwards), C. barabensis fumatus Thomas, C. triton nestor Thomas, Phodopus songorus campbelli (Thomas), Apodemus agrarius mantchuricus (Thomas), A. agrarius gloveri Kuroda, A. speciosus peninsulae (Thomas), Micromys minutus ussuricus (Barrett-Hamilton).

Rabid dogs are common. Dogs are now considered to be a reservoir of kala azar. The first Chinese canine kala azar case reported by Andrews in Shanghai in 1933 was suspected to have contracted the infection in Mukden.

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APPENDIX I

Death Rates per 10,000 among the Japanese population in Manchuria from 1932-1935*

Age	Under 1	1-4	5-9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 - 69	Over 70	Total Male	Total Female	Total Total	Corrected Death Rate
Parasitic Diseases	-	0.17	0.08	-	-	-	-	-	-	-	-	-	-	-	-	2.03	0.02	0.05	0.03	0.01
Tuberculosis	17.2	20.1	9.8	12.6	37.7	32.8	22.2	19.6	18.4	20.0	16.2	23.7	24.7	32.4	35.0	16.3	21.1	22.5	21.8	21.5
Pulmonary Tb.	7.3	6.5	3.7	7.3	30.4	25.5	18.6	16.8	16.0	18.2	14.4	20.9	22.9	30.0	33.5	14.2	16.3	16.1	16.2	16.0
Other Tb.	9.9	13.5	6.1	5.3	7.3	7.3	3.6	2.8	2.5	1.8	1.8	2.8	1.8	2.4	1.5	2.0	4.9	6.4	5.6	5.5
Diseases of Resp. Organs	188.8	38.1	3.5	2.5	7.5	7.3	6.8	6.5	8.1	9.4	13.5	16.4	35.5	46.2	87.4	185.9	17.6	16.7	17.1	24.6
Pneumonia & Bronchitis	162.9	31.4	3.0	1.4	4.0	4.2	4.8	3.8	5.4	6.6	7.1	10.9	21.6	21.1	49.5	89.5	12.4	12.4	12.4	16.5
Bronchitis	18.1	2.6	0.1	0.1	0.2	0.2	0.2	0.4	0.1	0.5	1.0	1.1	2.2	7.3	8.7	40.7	1.4	1.2	1.3	2.7
Pleurisy	4.1	3.3	0.3	0.9	3.2	2.8	1.7	1.2	1.7	1.3	2.4	1.4	3.1	3.2	8.7	8.1	2.1	2.0	2.1	2.3
Others	3.5	0.8	0.1	0.1	-	0.1	0.1	0.8	1.0	1.0	3.0	3.3	8.5	14.6	20.4	46.8	1.6	1.0	1.3	3.0
Diseases of Digestive Org.	87.4	34.4	5.6	3.1	5.8	4.7	4.6	4.2	5.5	7.9	12.2	15.9	20.2	34.8	49.5	124.1	12.3	11.9	12.1	17.1
Diarrhea & Enteritis	80.7	30.6	3.1	0.4	1.1	0.8	0.6	0.8	0.9	0.6	2.0	3.1	9.0	9.8	14.6	67.1	6.7	7.0	6.9	9.5
Diarrhea, Ent. & Dysentery	85.4	73.9	9.5	0.8	2.1	2.9	2.5	1.5	1.3	1.2	3.5	5.0	13.0	13.0	23.3	77.3	12.8	13.2	13.1	16.6
Infectious Diseases	142.5	88.8	16.8	5.3	9.4	9.9	9.0	7.6	7.8	7.8	7.3	8.9	12.1	22.7	26.2	46.8	21.6	21.1	21.4	24.0
Typhoid & Paratyphoid	-	0.8	0.7	1.4	5.2	4.7	4.0	3.8	4.4	2.8	1.8	2.0	1.8	4.9	1.5	-	3.0	2.8	2.9	2.6
Smallpox	12.7	1.1	0.2	0.1	0.5	0.4	0.8	0.6	0.6	1.8	1.2	1.7		3.3	4.4	2.0	1.2	0.8	1.0	1.2
Measles	26.8	13.8	1.4	-	0.1	-	-	-	-	-	-	-	-	-	-	-	2.3	2.2	2.3	2.5
Whoop. cough	31.8	8.9	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	2.2	1.7	1.9
Scarlet fever	8.0	11.6	3.3	0.5	0.2	0.6	0.7	0.3	0.8	0.4	-	-	-	-	-	-	2.1	2.0	2.1	2.2
Diphtheria	2.2	3.6	2.5	0.4	0.1	-	-	-	-	-	-	-	-	-	-	-	0.8	0.6	0.7	0.8
Influenza	13.1	2.1	0.6	0.2	0.1	0.2	0.1	0.2	0.1	0.6	0.2	-	-	2.4	2.9	22.4	0.9	0.9	0.9	1.6
Cholera	-	-	0.1	-	-	0.1	-	0.2	-	0.2	-	0.3	0.9	-	1.5	-	0.1	0.1	0.1	0.1
Dysentery and Ekiri	4.8	43.3	6.4	0.5	1.0	2.0	1.1	0.7	0.4	0.6	1.6	2.0	4.1	3.3	8.8	10.2	6.1	6.2	6.1	7.0
Typhus Fever	-	-	-	-	-	0.07	0.14	0.09	-	-	-	-	-	-	-	-	0.05	0.02	0.01	0.02
Spirochaetosis icterohaemorrh.	-	-	-	-	-	-	-	-	-	-	-	0.28	-	-	-	-	-	0.02	0.01	0.01
Syphilis	8.9	-	-	-	0.2	-	0.1	0.2	-	0.4	0.6	0.8	1.3	0.8	4.4	-	0.5	0.3	0.4	0.5
Pyemia & Sepsis	7.6	0.9	0.5	0.6	0.6	0.6	0.9	1.0	0.7	0.3	0.6	0.3	0.5	1.6	-	-	0.8	0.9	0.9	0.9
Mycosis	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.01	0.01
Relapsing Fever	-		-						0.03						-		0.03	-	0.02	0.02
Erysipelas	17.9		0.5						0.4						5.0		1.0	1.0	1.0	1.3
Poliomyelitis	-		0.14						0.01						-		0.03	0.07	0.05	0.05
Encephalitis ep. & leth.	-		-						-						0.41		-	0.02	0.01	0.03
Epid. Cerebro-spin. Meningitis	7.0		1.3						0.6						0.4		1.1	0.8	1.0	1.0
Rabies	-		0.08						0.04						-		0.08	0.02	0.05	0.05
Tetanus	1.0		0.06						0.01						-		0.06	0.04	0.05	0.05
Leprosy	-		-						-						0.41		0.02	-	0.01	0.03
Other infec. dis.	0.32		0.06						-						0.4		0.03	0.04	0.03	0.06

* Yamada & Kawahito, 1939

APPENDIX II

I. Fecal Examinations for Intestinal Parasites in Fu-Shun*.

Population Group and Total No. Examined:	General Population 3613		Mine Workers 2912		School Children 2695		Prisoners 331		Out-patients of Tien-shing Hospital 400		Total 10293	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ascaris lumbricoides	3152	87.24	2579	88.50	2203	81.70	299	90.30	295	73.70	8716	84.60
Fertilized eggs	2632	72.85	2048	70.30	1870	69.30	279	84.20	224	56.00	7163	69.50
Unfertilized eggs	1410	39.03	1529	52.50	1340	49.70	217	65.50	175	43.70	4804	46.60
Hookworms	1360	37.64	2341	80.30	355	13.20	105	31.70	80	20.00	4396	42.70
Ancylostoma duodenale	1339	37.06	2193	75.30	326	12.00	99	30.20	80	20.00	4186	40.60
Necator americanus	208	5.76	408	14.00	87	3.20	18	5.40	13	4.20	765	7.40
Trichocephalus trichiurus	1949	53.94	1765	60.60	713	26.40	172	51.90	153	38.20	4932	47.90
Enterobius vermicularis	71	1.97	113	3.80	33	1.20	24	7.20	11	2.70	260	2.50
Taenia solium	10	0.28	6	0.20	6	0.20	1	0.30	2	0.50	25	0.20
Taenia saginata	3	0.08	-	-	4	0.10	-	-	1	0.20	9	0.00
Hymenolepis nana	26	0.72	19	0.60	60	2.20	2	0.60	2	0.50	111	1.00
Hymenolepis diminuta	2	0.06	1	0.00	5	0.10	-	-	-	-	8	0.00
Metagonimus yokogawai	43	1.19	7	0.20	8	0.20	-	-	11	2.70	108	1.00
Clonorchis sinensis	8	0.22	-	-	2	0.10	-	-	2	0.70	16	0.10
Fasciolopsis buski	2	0.06	1	0.00	1	0.00	-	-	-	-	4	0.00
Trichostrongylus orientalis	27	0.75	28	0.90	8	0.20	1	0.30	12	3.00	84	0.80
Strongyloides stercoralis	2	0.06	1	0.00	1	0.00	-	-	-	-	9	0.00
Dicrocoelium dendriticum	15	0.42	9	0.00	1	0.00	-	-	-	-	36	0.30
Endamoeba histolytica	771	21.34	889	30.00	401	14.80	100	30.20	142	37.20	2364	22.90
Endamoeba coli	1746	48.33	1690	58.00	1271	47.10	119	33.90	171	42.70	5097	49.40
Endolimax nana	1646	45.56	1533	52.60	992	36.80	85	25.70	148	39.20	4488	43.60
Iodamoeba	327	9.05	381	13.00	219	8.10	48	14.50	19	4.70	1003	9.70
Giardia	336	9.30	479	16.40	413	15.30	64	19.30	29	7.20	1361	13.20
Chilomastix	105	2.91	187	6.40	88	3.20	23	6.90	11	2.70	425	4.10
Dientamoeba	142	3.93	-	-	-	-	12	3.60	14	3.50	460	4.40
Enteromonas	58	1.61	-	-	-	-	3	0.90	4	1.00	172	1.60
Embadamonas	17	0.47	-	-	-	-	2	0.60	2	0.50	63	0.60
Trichomonas hominis	130	3.60	175	6.00	61	2.20	25	7.50	8	2.00	409	3.00

*Ryo, 1936

2. Fecal Examinations for Intestinal Parasites in Various Localities in Manchuria (in %).

Locality	No. Examined	Ascaris lumbricoides	Trichocephalus trichiurus	Hookworms	Trichostrongylus Orientalis	Enterobius vermicularis	Tapeworms	Clonorchis sinensis	Metagonimus yokogawai	Paragonimus westermani	Author and date
Ta-lien	1919	47.2	42.1	17.6	0.1	0.2	0.5		1.6		Yoshitomi, 1921
Ta-lien	2906	57.6	23.4	1.0				+	+		Moriwaki
Ta-lien	107	85.0	80.7	50.5		+					Hiyeda and Suzuki
Ta-lien	326	77.0	42.0	34.0	+	+	+	+			Saito, 1935
Ta-lien	1026	39.0	12.0	0.5			+				Okamoto, 1930
Ta-lien	12492	21.6	25.5	10.7	+	+	+	+		+	Morikawa & Fukuda, 1937
Ta-lien	371	38.6	52.0	15.1			+	+		+	Morikawa & Fukuda, 1937
Ta-lien	381	17.3	15.3	8.1			+	+			Morikawa & Fukuda, 1937
Lu-shun	954	87.3	66.5	19.6							
Ying-kou	350	51.1	21.4	6.0		8.0	6.5				Kitabatake, 1935
Chin-chou	62	45.1	25.8	+		+					Kitabatake, 1935
Liao-yang	151	74.8	42.6	61.6	+	+	+	+			Hiyeda and Suzuki
An-shan	151	64.8	21.9	50.3		+					Hiyeda and Suzuki
An-tung	120	70.8	70.7	49.2							Hiyeda and Suzuki
Fu-shun	4414	78.0	12.0	18.0	+	1.5	+	+			S M R Co.
Fu-shun	114	79.8	30.7	54.4		+	+				Hiyeda and Suzuki
Mukden	650	66.0	25.0	0.9	+	+	0.3	+			Shimizu et al., 1925
Mukden	308	49.0	9.7	6.8	+						Ishikawa, 1929
Mukden	316	36.7	37.0	10.1	3.1	+	+	1.8			Ishikawa, 1929
Mukden	32	62.5	16.3	6.3		+					Hiyeda and Suzuki
Ch'ang-ch'un	85	48.2	30.6	2.4							
Harbin	350	19.7	4.6	5.1	0.8	0.3	0.6	0.6	0.3	0.3	Lin and Wu, 1927
Eastern Mongolia	234	60.3	1.6			0.4	4.4				Ishikawa, 1929

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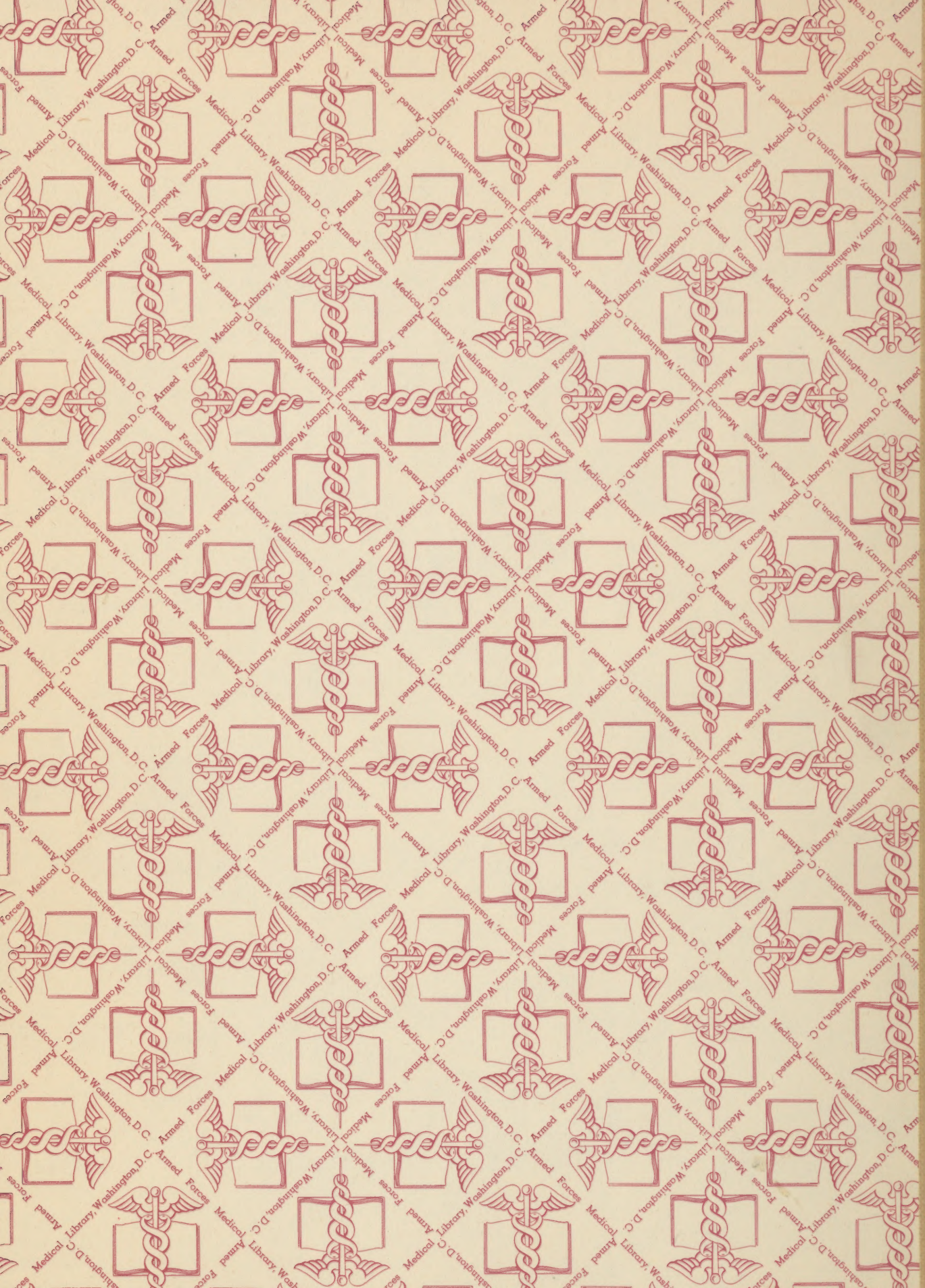
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